SCIENTIFIC AMERICAN

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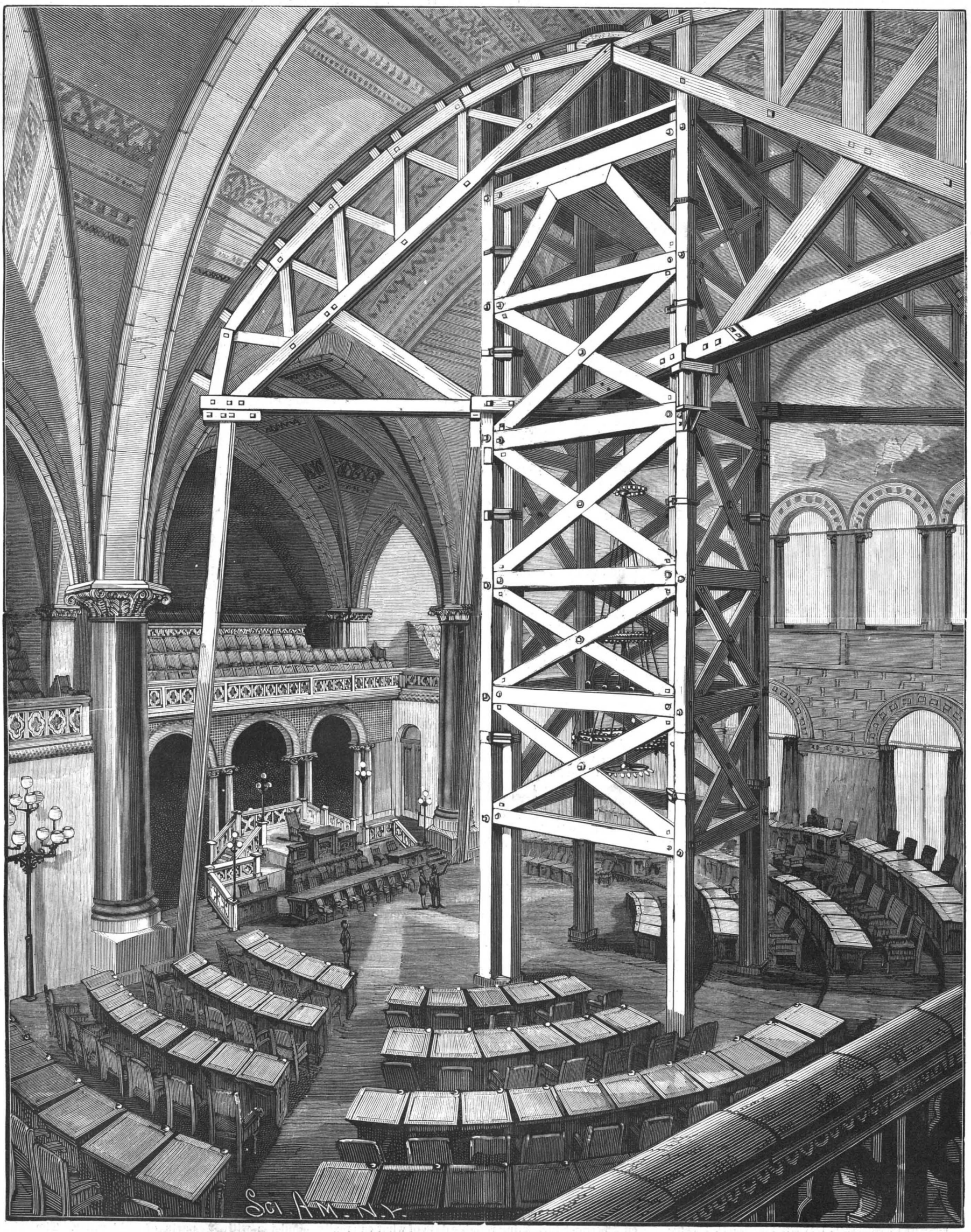

THE CAPITOL BUILDING, ALBANY, N. Y.—TEMPORARY TRESTLE FOR SUPPORTING THE CRACKED CEILING.—[See page 148.]

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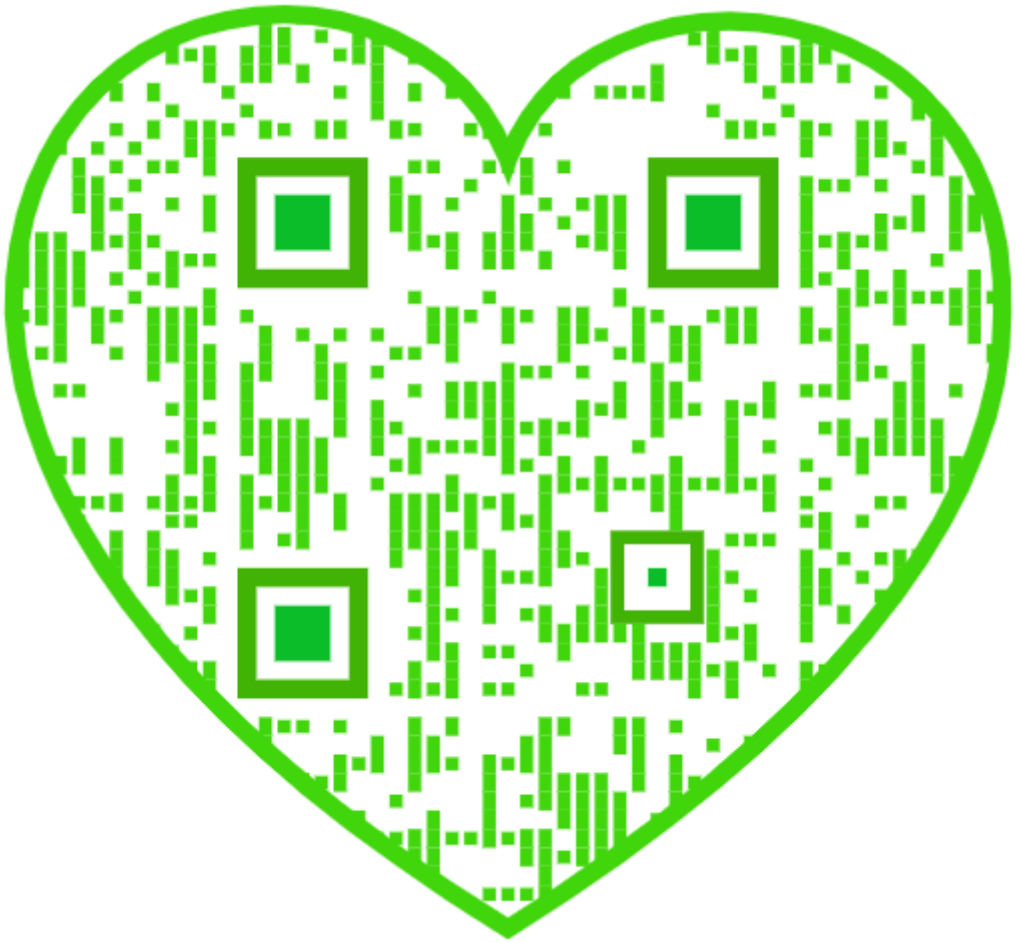

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Contents.

(Illustrated articles are marked with an asterisk.)

Aphengescope, mammoth..... 149
Beggary, how to abolish..... 147
Boils and carbuncles, new treatment for..... 149
Books and publications 154
Boomerang, mystery of the..... 146
Business and personal..... 154
Calcimine and its varied tints... 147
Car coupling, improved*..... 149
Ceiling, defective, in Capitol at Albany*.....143, 148
Corcoran, W. W., death of..... 145
Cloud indications..... 147
Crazy? who is never..... 145
Disease, communicability of, from animals to man..... 152
Eagle, sea*..... 153
Engines of the S.S. Courier*..146, 147
Eyes, care of..... 149
Fox, cunning of..... 153
Floors, hardwood, waxing..... 149
Flour, production..... 145
French Exhibition of 1889*..... 150
Glass and china manufactories.. 152
Gun, dynamite, for Italian government..... 152
Gun, great, bursting of... 147
Incandescent electric lamp, minor phenomena of..... 144
Insurance company, life, a solid. 145
International Geological Congress 153
Inventions, agricultural..... 154
Inventions, engineering..... 154
Inventions, index of..... 155
Inventions, miscellaneous..... 154
Kerosene emulsion for scale insects 144
Laboratory, Loomis, opening of. 145
Lard, what made of..... 145
Military notes..... 145
Natural history notes..... 153
Notes and queries..... 155
Scale, weighing, improved*..... 149
Ships, modern war, tests for..... 144
Swamp, cypress, how to utilize.. 152
Technology Architectural Review 145
Telegraph circuit of over 10,000 miles 146
Timber forests in Siam..... 147
Tower, great, of French Exhibition*..... 150
Trade mark difficulties..... 150

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 686,

For the Week Ending March 10, 1888.

Price 10 cents. For sale by all newsdealers.

PAGE

I. CHEMISTRY.—Test for Aniline Colors in Wines or Fruit Juices.—A simple test for this form of adulteration of food or beverage.... 10166
The Chemistry of Substances Taking Part in Putrefaction and Antisepsis.—By JOHN M. THOMPSON, F.R.S.E.—The second of these important lectures, giving a peculiarly exhaustive review of their recondite subject..... 10164

II. ELECTRICITY.—Cooper's Thermo-magnetic Motor.—A simple motor of 1884, the invention of Mr. W. B. Cooper, of Philadelphia.—1 illustration..... 10160
Magnetism Produced by Steam.—A most interesting and simple experiment in magnetism illustrated and described.—1 illustration 10160
The Last Model of the Aron Electric Meter..... 10160
The Position and Prospects of Electricity as Applied to Engineering.—By WILLIAM GEIPEL.—An exhaustive practical view of the practical applications of electricity to industrial uses..... 10157

III. ENGINEERING.—Rigg's High Speed Revolving Steam Engine.—A new and ingenious type of four cylinder engine, capable of attaining 2,000 revolutions per minute.—2 illustrations..... 10156
The New Dufferin Bridge, Benares.—A recent iron railroad bridge crossing the Ganges.—Dimensions and cost of the structure.—4 illustrations..... 10157
Work on the Panama Canal.—A full description of the work now in progress on the Isthmus.—9 illustrations..... 10151

IV. ENTOMOLOGY.—A Curious Form of Caterpillar.—Description and illustration of an Indian caterpillar and its curious attitudes.—4 illustrations..... 10166

V. MISCELLANEOUS.—The Necessity for a Patent System, and the advantages to be derived therefrom.—By GEO. O. G. COALE.—An enlightened review of this question, and the opinion of inventors and others concerning it..... 10163
The Universal Exhibition at Barcelona in 1888.—The opening of the Barcelona exhibition.—The grounds and palace of industry.—2 illustrations..... 10163
Two Puzzles.—A pair of interesting geometrical puzzles.—2 illustrations..... 10163

VI. NAVAL ENGINEERING.—The First Atlantic Steamship.—By HOWARD FULLER.—An interesting account by the great-grandson of the navigator of the first steamer that crossed the Atlantic, with characteristic entries from her log book..... 10153

VII. ORDNANCE.—Dynamite Shells Fired from Ordinary Guns.—The recent experiments with Lieut. James W. Graydon's high explosive shells.—Their effects upon a turret segment.—3 illustrations..... 10154
The Pneumatic Dynamite Gun.—The English view of the Zalinski gun.—A eulogistic lecture by Capt. HAIG before the United Service Institution of Great Britain..... 10155

VIII. PHOTOGRAPHY.—New Direct Platinotype Process.—Full account with formulæ of the new process..... 10162

IX. TECHNOLOGY.—An Inverted Clamond Lamp.—An application of the regenerative principle to this well known incandescent burner.—1 illustration..... 10160
Dietzsch's Kiln for the Continuous Burning of Cement Limestone and other Materials.—An improved furnace and the results obtained by its use.—Comparison with other recent forms.—1 illustration..... 10162
Moulder's Tools.—The tools of the foundry moulder and their uses.—With illustrations of the different implements.—5 illustrations..... 10161
Wool Bleaching with Hydrogen Peroxide.—Details of the application of this new process..... 10162

MINOR PHENOMENA OF THE INCANDESCENT ELECTRIC LAMP.

The incandescent electric lamp has already been cited as giving an illustration of irradiation. When in full action, it presents no longer to the distant eye a simple loop of glowing carbon. By irradiation the outline is lost, and it resembles a gas flame. The same object illustrates very perfectly some of the phenomena of persistence of vision. The old example of the whirling ember, the thaumatrope and many other scientific toys, could be cited that are based upon this principle. It is also well known that if a spot of specific color is looked at intently for some time and the eye is then turned upon a white surface, the complementarily colored spectral image of the spot will appear. The nerves of the eye, it is assumed, become fatigued for the original tint, and hence, receiving white light, are affected by the residual colors. This is the reverse effect of persistence of vision. By the latter, properly speaking, the true image retains its effect. But the two are intimately related, as opposite effects so often are in the world of nature.

If an incandescent burner is gazed at while near the eye, the filament can be distinctly seen. Now, if the eye is closed, the image of the filament remains, and appears in clear outline in a purplish or violet color. The characteristic shape of the particular filament is especially distinct. If, in looking at it, particular care is taken to avoid remembering its appearance (and this disciplining of the mnemonic faculty is not difficult), the spectral image seen with the closed eye will vividly portray the filament and its peculiarities. Sometimes it seems as if the effects of irradiation could be partly overcome; as if the image of a distant lamp could be reproduced free from the glow of irradiation. To a degree this may be possible, but a fully ignited and distant lamp always gives a confused spectral image to the closed eye.

The filament of the high resistance lamps illustrates elasticity very well. Surrounded by a vacuum, so as to be free from the damping effects of the air, no object more sensitive to vibrations or shocks can be found. The least tremor of the wall to which the lamps are attached makes the loop vibrate for a long period. This only takes place when they are cold. When the current is passing and they become red or white hot, they are no longer so elastic, and cannot be made to vibrate as before.

By the same vibrations sound is often produced. The vacuum of the globe prevents the sound from being heard by atmospheric transmission. But the filament is in solid connection with the globe and socket. If it is set in strong vibration, and the lamp is held pressed against the ear, a ringing metallic sound will be heard. This cannot be done with all burners. A certain size is naturally essential, as the sound is at best a weak one.

It would seem possible that a visual seismograph of extreme sensitiveness could be made on the general lines of an incandescent burner. It is probable that a filament could be obtained in this way more affected by external vibrations than is the most sensitive device now used.

TESTS FOR MODERN WAR SHIPS.

Admiral Fremantle, R. N., had some valuable experience recently, when, in a sham battle, he tried to break through the lines established by Admiral Hewitt, in the Irish Channel, and it is for this reason mainly that his paper on "Speed as a Factor in Naval Warfare" has a special value. Once more the man of action shows the mistakes of the theorist. Once more figures that are said never to lie are shown to be at least capable of deceiving. In not a single case, it seems, have the big war ships fulfilled the promises made for them by their builders; for though apparently within the power of the mathematician to calculate what speed can be got out of a certain shape and weight with engines of a certain power, when tried in smooth water and under favorable circumstances, they are apparently wholly unable to estimate what this mass can accomplish under other and less favoring conditions, and this inclines the old sailor, like Admiral Fremantle, to look upon all their computations with suspicion. In the recent experiences in the Irish Channel and North Sea, when the seas were heavy and the winds high, many of the ships set down on paper as the fastest fell sadly behind, and those which had been recommended for steadiness and mobility, to make up for their want of speed, often refused to answer their helms.

Admiral Fremantle has learnt, he says, that the best way to test a modern ship is to send her to sea and let her go her best for say 1,000 miles. This will show what she is good for in all weathers as to speed, how she minds her helm in a beam, quartering, fair, and head wind, the length of time her bunkers are capable of supplying her with coal, and the distance she can get over without recoaling. Such cruises would, of course, run up large coal bills, but, as he says, they would pay in the end, because furnishing reliable data of what can really be expected from each individual ship.

After explaining how important speed is in working ships, the Admiral proceeds to look with favor upon many of the ships which gave such a poor account of themselves in the recent maneuvers, because they are, in his opinion, well enough in their class. He says: "The ironclads of the 'Admiral' class and the belted cruisers designed by Sir N. Barnaby form groups of the fastest vessels in the world of their respective classes." But it has been and is a subject of controversy whether or no some of these classes are useless because wholly unable to serve the purpose for which they were designed. If, for instance, there is any service to which the slow belted cruisers with small batteries can be put, the same has not yet been shown. There are ships twice as powerful now afloat, which are fast enough to overhaul them when it comes to speed. They are not heavy enough to resist the guns of a modern fortress, and have not sufficient stability to carry heavier batteries.

Naval Constructor White, who is quoted by the Admiral, throws every other condition aside and demands speed first of all. He says: "Wide differences of opinion exist on many if not most of the features of war ship design, but there is almost absolute agreement that high speed is of primary importance in all classes. It has been well said that, in future naval actions, speed will be the equivalent of 'weather gauge' in the past. The swiftest vessels have the power of choosing their range and relative position, forcing or avoiding an action."

In other words, in the general action of the future no one will stop to learn if such or such a ship is really fast "for her class;" if she cannot stand the pace she must fall behind, or if too slow to get away from heavier batteries, she must go down before them. This is the practical principle which Naval Constructor White is pressing to the attention of the British Admiralty, and it would seem a sound one for us to keep in view in building our new navy. Another interesting study for us will be found in these coming long distance tests of the several classes of British war ships, if they are really made. Admiral Fremantle says: "We want practical trials as to the possibility of turret ships keeping the sea and making a passage at speed in dirty weather in the bay. Are the barbette vessels better sea boats and better able to steam fast? Have the echeloned turret ships any advantages at all?

The answer to these questions we may await with quite as much impatience as the British, for until we have them, we cannot proceed with naval construction with open eyes and proper precaution.

THE KEROSENE EMULSION FOR SCALE INSECTS.

A paragraph is going the rounds of the agricultural press entitled "Remedy for Scale Insects," quoting Professor Riley as having had the best results in fighting scale insects with kerosene emulsion prepared after the following formula: "Take the white of two eggs, three tablespoonfuls of sugar, three-quarters of a quart of water, and one quart of kerosene. Mix thoroughly, by working them together by means of a force pump and cyclone nozzle for five or ten minutes. The emulsion so produced can afterward be diluted with water to any desired amount."

This is in reality, as we have reason to know, quite misleading. What Professor Riley has said in reference to this matter is contained in the introduction to his last annual report as United States entomologist:

"In connection with the subject of kerosene emulsion, I may put on record here an important discovery made last spring, in carrying on further experiments at the office in emulsifying this oil. It is that the white of eggs with a little sugar may be used as a satisfactory substitute for milk where this is not accessible.

"If the white of 2 eggs, about 3 tablespoonfuls of sugar, ¾ quart of water, and 1¼ quarts of kerosene are worked through a force pump and cyclone nozzle for from 5 to 10 minutes, a cream-like emulsion is produced, which can be diluted with water to any desired amount without any separation of the oil; provided that the emulsion is not allowed to stand for any length of time."

This method of emulsifying kerosene oil is, as will be seen, suggested only as a substitute for milk where that is not accessible. The formula that Professor Riley has from the beginning recommended, and which is frequently attributed to others, is really that found to be most satisfactory in experiments made under his direction by Mr. G. H. Hubbard, in 1881. It is as follows:

Kerosene	2 gallons	=67 per cent.
Common soap or whale oil soap	½ pound	=33 per cent.
Water	1 gallon	

Heat the solution of soap and add it boiling hot to the kerosene. Churn the mixture by means of a force pump and spray nozzle for five or ten minutes. The emulsion, if perfect, forms a cream which thickens on cooling, and should adhere without oiliness to the surface of glass. Dilute before using, 1 part of the emulsion with 9 parts of cold water. The above formula gives 3 gallons of emulsion, and makes when diluted 30 gallons of wash.

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Military Notes.

The magazine rifle selected for the use of the British army was recently put through a series of tests to measure its accuracy, penetration, range, etc. The dilatoriness of the English seems to have stood them in good stead this time, for while the Germans are discarding the "Mauser-70–86" magazine rifle scarcely a twelve month after its adoption, because of its caliber (11 mm.), they have benefited by the experience, and pin their faith to a caliber nearly one-third smaller. The new gun weighs no more than the Martini-Henry, which, modified more or less, has been in continual use in the British army for seventeen years. It has a detachable magazine placed in front of the trigger guard and holding eight rounds, with one more rammed home in the breech, making nine. When one magazine is exhausted, it is detached with a single movement and another snapped on. The powder is compressed on the Swiss system, with the result that smaller and lighter bullets may be used. The soldier will be able to carry 115 rounds, where before he had only 70. Still better, the trajectory is flat and the range much greater than that of the old style rifle.

The fear that France or Germany, in the event of war, will attempt a rush through Belgium, has inspired the Belgians to tremendous exertions to prevent such a calamity. The new fortifications on the Meuse have been pushed, until now the builders have arrived at the second stage of construction. At the two forks of the river, to wit, at Namur and Liege, there have been erected enormous works with steel facings bristling with guns.

It seems that most of the war material for these fortifications was long since ordered from the Krupp company, at Essen, Germany, and, as the prevailing sentiment of Belgium is with the French, this has been the subject of protest. Recently it was discovered that the enterprising Krupp company were subletting a portion of their contract to Belgian foundries, and now the *Independence Belge* and *La Defense Nationale* are demanding to know if it would not be cheaper in the end to contract directly with home manufacturers than thus to order material from Belgium by way of Germany?

Rather severe criticisms on our navy are appearing in the English journals. The critics admit we have as good naval officers as any, but say that what ships we have are manned by Englishmen, Irishmen, Germans, Scandinavians, and negroes. This is true in time of peace; for first-rate American sailor men can make more than $21.50 a month ashore. But once the signal of war comes, and the promise of prize money and adventure, and there would be little room for much of the poor material now manning the yards. The great fleet that Farragut led past the Mississippi forts was manned with Gloucester fishermen—men who, unlike the average blue jacket, combine a keen intelligence with strength and daring. The day of the "square-rigger" is gone by, for the modern war ship has no sails, and a quick hand at the gun sight and block, tackle, and gearing is more in demand than one that can hand, reef, and steer. Indeed, it is a curious study to watch how, in the war ship of to-day, the sailor is declining and the engineer and machinist advancing. Perhaps in the future the crew of a war ship will be composed of three classes only: scientists, engineers, and coal heavers or oil feeders.

The recent publication of the Austro-Prussian agreement, and the action of Russia in massing troops on her frontier, have so convinced the Italian press that war is imminent, that it is demanding the recall of the expeditionary corps sent last autumn against King John of Abyssinia. This corps, composed of between 600 and 700 of the best officers of the Italian army and nearly 20,000 picked troops, has not as yet shown any inclination to go after the black king, but, on the contrary, has remained cooped up in the fortified town of Massowah, on the coast, apparently waiting for him to seek them out and attack them while they are behind their works.

The Italian fleet is being got ready for immediate service, and in the arsenals at Naples and Spezia work is going on night and day, preparing material for repairs to the ships. The principal rendezvous of the fleet is at Madalena, a splendid anchorage protected by a group of small islands.

The military preparations of Russia still furnish the European journals with cause for alarm. The *Deutsche Heeres Zeitung* thus describes the arrangements Russia is making to feed an army on her frontier: Large quantities of provisions for man and beast are being sent forward. At Rovno, in Volhynia, there is already 120,000 hectoliters [a hectoliter is 2¾ bushels] and more is arriving all the time. Rovno is situated not far from the Galician frontier and upon the great trunk railway stretching from Kiew to Varsovie. At other points the construction of new storehouses is being rapidly pushed. From another source it is learned that infantry camps are being established at various points of the railway, a hundred or two miles from the German border, "within sight of the frontier," as they say, and ready at a moment's notice for the alarm of war. Since Bismarck's recent admission that Russia has certain rights in Bulgaria, under the Berlin treaty, it would look as if these preparations meant little more than a determination on the part of Russia not to be caught napping again, even if the unexpected should happen.

Death of W. W. Corcoran.

On February 24, at 6 A. M., William Wilson Corcoran, eminent as a financier and public benefactor, breathed his last. He was born in Georgetown, D. C., December 27, 1798, thus having passed his eighty-ninth year. His father emigrated from Ireland in 1793. After various vicissitudes he acquired a fortune from the establishment by himself and George W. Riggs of the banking house of Riggs & Co., of Washington. In 1854 he was able to retire from business with an independent fortune. The University of Virginia, the Virginia Military Institute, the Columbian University of Washington, D. C., William and Mary College, and the Washington and Lee University, were all the recipients of gifts from him. Many other benefactions caused him to acquire the name of the Peabody of Washington. His greatest gift to the public is the Corcoran Art Gallery. The well known building on Pennsylvania Avenue in that city containing the collection cost, it is said, $250,000; the collection of pictures and statuary was estimated at the beginning at $100,000; and a permanent endowment of $900,000 assures the maintenance of the benefaction. It is said to be the largest gift ever made to art by a private person. His funeral took place on the 27th, and his body was interred in Oak Hill Cemetery. This was a fitting resting place, as he had while living endowed the cemetery.

Opening of the Loomis Laboratory.

The Loomis Laboratory, the last accession to the medical department of the University of the City of New York, was formally opened on February 27. It is situated in East 26th Street, opposite Bellevue Hospital. It is the gift of an unknown donor, and is named in honor of Dr. Alfred L. Loomis. It was to a great extent under his guidance that the donation was thus applied. The building is a fireproof five story structure. The separate floors are respectively devoted to physics and materia medica, chemistry, physiology and histology, pathology, and the last and highest floor to bacteriology. The opening was attended by a large gathering of professional and other representative guests. The erection of the building and the choice of its uses indicates the broadening of the physician's education that is slowly but inevitably taking place. The old rigid code of ethics and desire to make instruction practical have operated to restrain innovation and have exercised a conservative influence upon the training of medical students that has had its bad as well as good effects. In the devotion of more time to allied branches of science, such as physics and chemistry, a most beneficial effect may be looked for. The Loomis Laboratory provides for these branches, and, with the new establishment of the College of Physicians and Surgeons, will operate to increase the importance of New York as a center of instruction and investigation in the medical world.

Who is Never Crazy?

There are many firm believers in the theory that most people are crazy at times, and facts seem to support their belief. The following, from a source unknown to the writer, will likely remind a number of our readers of some incident in their experience, which at the time of its occurrence seemed to them most unaccountable:

"A wise man will step backward off a porch or into a mud puddle, a great philosopher will hunt for the specks that are in his hand or on his forehead, a hunter will sometimes shoot himself or his dog. A working girl had been feeding a great clothing knife for ten years. One day she watched the knife come down slowly upon her hand. Too late she woke out of her stupor with one hand gone. For a few seconds her mind had failed, and she sat by her machine a temporary lunatic and had watched the knife approach her own hand. A distinguished professor was teaching near a canal. Walking along one evening in summer he walked as deliberately into the canal as he had been walking along the path a second before. He was brought to his senses by the water and mud and the absurdity of the situation. He had on a new suit of clothes and a new silk hat, but though the damage was thus great, he still laughs over the adventure. Our mail collectors find in the iron boxes along the streets all sorts of papers and articles which have been put in by some hand from whose motions the mind has become detached for a second. A glove, a pair of spectacles, a deed, a mortgage, a theater ticket, goes in, and on goes the person, holding on to the regular letter which should have been deposited. This is called absent-mindedness, but is a brief lunacy."

A Solid Life Insurance Company.

The figures of the last annual report of the New York Life Insurance Company, just issued, present a record of almost unexampled success in the conduct of the business of that old and strong company for the past year. The number of policies issued during the year 1887 was 28,522, and the total number in force January 1, 1888, was 113,323. The assets of the company on the 1st of last January amounted to more than eighty-three million dollars. It goes without the saying that this great company does its insurance business on strictly business principles, its officers and trustees being among the most responsible business men in the city. This company recognizes the policy holder's right to paid-up insurance in case of a discontinuance of payment of premiums, and its policies are notably free from restrictions as to occupation, residence, and travel. The company issues a great variety of policies, thus adapting its contracts to the wants of almost every one having present means from which a small percentage can be spared for the benefit of themselves or those dependent upon them at a future date.

The Technology Architectural Review.

We have received the first number of this most attractive publication. It is published under the auspices of the Massachusetts Institute of Technology. It aims to be little more than a collection of plates illustrating the "mentioned" designs made at that institute. This rule the editors propose departing from only when outside material of unusual interest presents itself. Thus, in the present number, is given a reproduction of drawings of "Cori Fragments," made by Mr. Emmanuel Brune while a *pensionnaire* of the French Academy in Rome. The drawings were exhibited in Paris in 1866 or ther abouts as *Envois de Rome*. They are contributed to the *Review* by Prof. William R. Ware, of Columbia College. The other plates include designs for a fountain in a public park, for a casino, and a life study of a man from the Cowles Art School, of Boston. The elegance of th make-up leaves nothing to be desired. The plates are executed by the gelatine process, and are printed in tinted ink. In the text, which is altogether subsidiary, are given the requirements for the designs, the awards, names of "mentioned" men, and criticisms of each design. The names of the jury of award and of the critic also appear. The *Review* is issued monthly during the school year of eight months, under the management of Messrs. Henry D. Bates and Thomas R. Kimball, at Boston, Mass.

What Lard is Made of.

A bill has been introduced in the Senate at Washington providing for the stamping of all packages containing any preparations of lard. The testimony given before the Senate Committee on Agriculture by parties who have examined various preparations of lard now on the market has added materially to the stock of public information on this point. A chemical examination of several prominent brands of "family lard" has shown them to be variously constituted. One sample examined seems to have been totally innocent of any trace of hog lard, and to have been made up chiefly of beef fat and cottonseed oil. Other brands of lard have contained varying percentages of the above articles, with the addition of hog lard and stearine. One brand in particular contained 60 per cent pure lard, 20 per cent cottonseed oil, and 20 per cent stearine.

A prominent lard manufacturer testified at the inquiry that seven-eighths of the lard of commerce was made up of various portions of the bodies of hogs added to cottonseed and stearine. Testimony was adduced tending to show that the lard constituted as above was more popular than the pure lard itself. An example of this was shown in the case of a manufacturer who was at one time unable to supply the demand for the adulterated article, and furnished his customers with pure lard instead. The result of this effort to supply the demands was the receipt of large numbers of letters complaining of the bad quality of pure product thus furnished. Another feature of the inquiry is the attitude taken by several leading Southern newspapers, commercial exchanges, and legislatures, who declare that the bill is really aimed at and designed to injure one of the most important Southern industries—the manufacture of cottonseed oil.—*Bradstreet's.*

THE *Northwestern Miller* of February 24 makes the following statement in respect to the enormous production of flour in the West: The Minneapolis mills made 114,100 barrels of flour last week, and exported 55,000 barrels. The market is steady, but not active. The St. Louis mills made 68,700 barrels last week. The market has been more active, and the output will be larger this week. Thirty-nine Northwestern mills outside of Minneapolis made 359,694 barrels of flour in January, as against 338,576 barrels for the same month in 1887. These mills exported 91,443 barrels in January, against 70,808 barrels in that month last year.

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A Telegraph Circuit of over Ten Thousand Miles.

Operators at the office of the Postal Telegraph Co., on State Street, Albany, lately witnessed a conversation carried on by wire over the largest circuit ever worked, and was the greatest telegraphic feat yet accomplished.

As explained to the Albany *Express* reporter, who dropped into the neat and business-like office while the experiment was going on, the trial was a most interesting one. It appears that Special Commissioner Henry Norman, who is making a tour of the British colonies, having arrived at Vancouver, carried on a conversation with London, England, over the Canadian Pacific and Commercial Co.'s wires. At one end of the line was Mr. Hearst, of the San Francisco *Examiner*, and at the other end Mr. Stead, of the *Pall Mall Gazette*, London.

There was an unbroken telegraph circuit from San Francisco to New York, 4,600 miles, the distance from New York to London, *via* Canso, N. S., being 3,500, or 8,100 miles in all. The telegraph lines making up this circuit ran from San Francisco to New York, *via* Vancouver, B. C., Montreal, and Albany, connecting at New York with the Mackay-Bennett Postal Cable Co. Telegrams exchanged between San Francisco and London were therefore only repeated at New York, Canso, and Bristol, England, the latter point being the landing place of the Mackay-Bennett cable. The object of this experiment was to demonstrate the fact that London and Vancouver were practically within "speaking distance" of each other. These unbroken lines demonstrate the fact that their system can be successfully maintained during the most rigorous season of the year.

At 1:12 P. M. Mr. Norman, at Vancouver, asked Mr. Stead, at London, a question, receiving a reply in five minutes. Mr. Stead then asked, "How far off are you from London?" In four minutes reply flashed back, "Nine thousand six hundred miles," which, with the 1,200 miles to San Francisco added, makes a grand total of 10,800 miles. Conversation was kept up for two hours. Mr. Norman said, among other things, "I can see the Pacific, and in a few days start on a 4,000 mile voyage in another English ship, the Parthia, over another ocean; yet I am able to report myself to you and talk as quickly and easily as if we were speaking through a tube. The wire which unites us is a most striking symbol of our imperial unity, and of the unfailing federation which will one day girdle the globe, Is not the click of this key, heard in two hemispheres, more eloquent than all the arguments of empire ever penned?"

The Mystery of the Boomerang.

An exhibition of boomerang throwing was recently given by a party of Australian natives at Munster, before some German scientific men, who are endeavoring to discover the cause of the boomerang's curious flight. *Iron* tells its readers that the instruments used were of two sizes, the larger being a slender crescent about 2 feet long, 2½ inches wide, and ¼ inch thick, made of an exceptionally heavy Australian iron-wood. This boomerang was jerked up into the air about a hundred yards, when it flew straight away, then turned to the left, and returned in a curved line back to the thrower, whirling around constantly and whizzing unpleasantly. One badly directed projectile passed through a spectator's hat, and with a cut as clean as that of a razor. We have not heard what conclusions the German scientists have come to, or whether they have satisfactorily solved the problem, but, according to a German manufacturer, who has made some 11,000 toy boomerangs, the mystery of the movement lies in the shape, the boomerang having a sharper curvature in the middle, with unequal length of the two arms, which must be made of equal weight by unequal thickness. The peculiarity of motion is said to be due to the difference in the length of the arms, which diverges the curve of rotation from the circular.

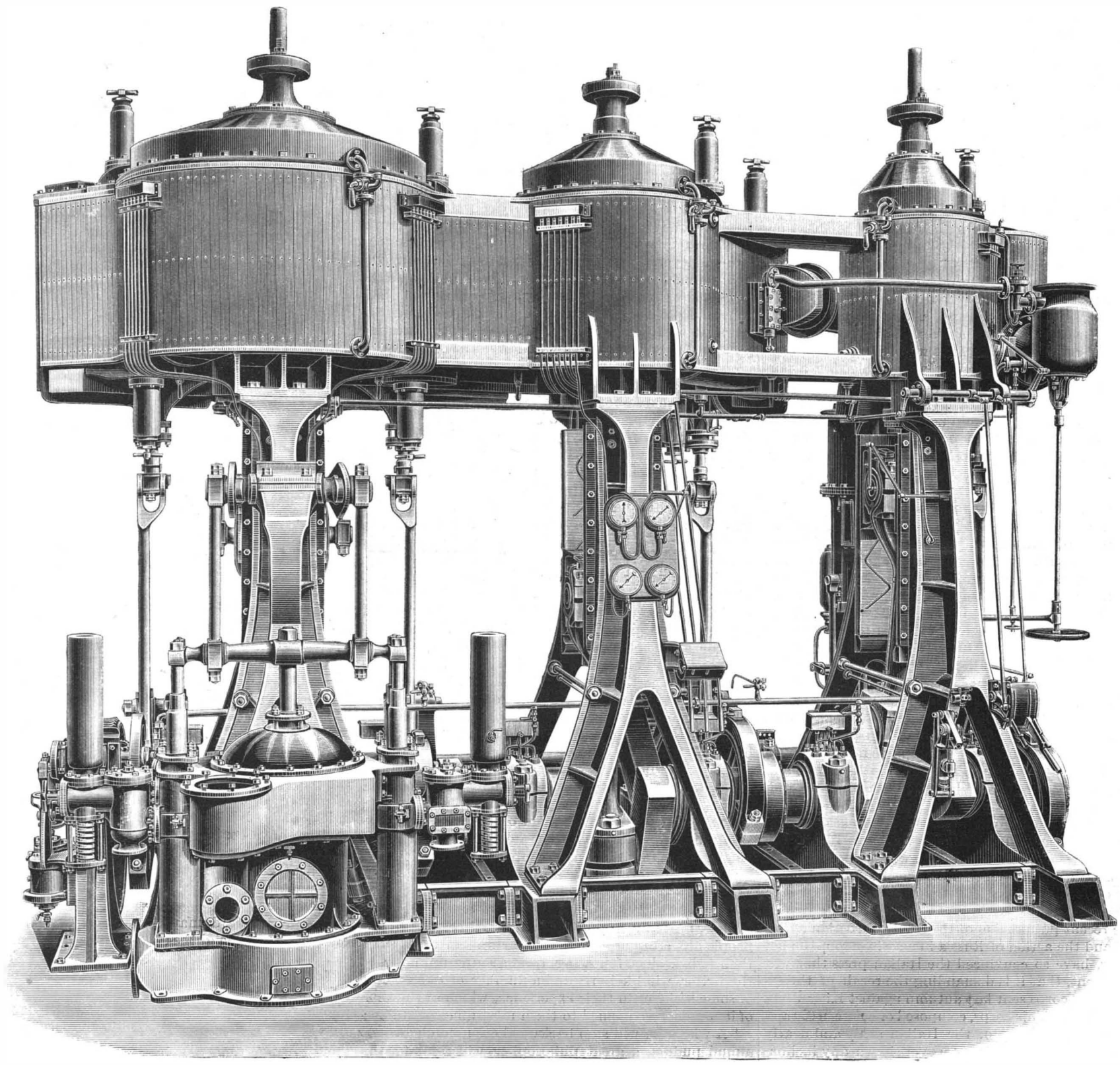
ENGINES OF THE STEAMSHIP COURIER.

We give views of the engines of the high speed steamship Courier, which has been built to the order of Messrs. Huddart, Parker & Co., of Melbourne. The vessel has been built by Messrs. Swan & Hunter, of Wallsend, and is 220 feet long by 30 feet beam and draws 11 feet of water. Owing to the comparatively small dimensions of the boat, Messrs. R. and W. Hawthorn, Leslie & Co., Limited, the builders of the machinery, had a somewhat difficult task to execute in driving the vessel at a speed of 17½ knots, and it became necessary to adopt special means of producing the great power required, without unduly increasing the weight of the machinery or the space occupied by it. Forced draught and machinery of the high speed type were therefore adopted, and in the latter cast steel and gun metal have been largely employed.

The illustrations represent the engines as erected in the shop. They are of the triple expansion type, and are fitted with Marshall's patent valve gear. The bed plates and main pillars are of cast steel. The condenser, which has 5,000 square feet of cooling surface, is separate from the engines, and is of gun metal. The cylinders are 30 in., 46 in., and 73 in. in diameter respectively, by 36 in. stroke. Steam at a working pressure of 150 lb. per square inch is supplied from two multitubular boilers, 15 ft. 3 in. in diameter and 11 ft. long, each of which has four corrugated furnaces, 3 ft. 2 in. inside diameter. The total heating surface provided is 5,110 square feet, and the grate area is 158 square feet.

The forced draught is supplied by two double-sided fans, each driven by a high speed compound engine, and capable of producing in ordinary work an air pressure of 2 inches on the water gauge in the stoke hold.

The trial trip took place on October 28, 1887, the vessel running two double runs on the Admiralty course of 9·6 knots between Cullercoats and Newbiggin, off the mouth of the Tyne, when an average speed of



TRIPLE EXPANSION ENGINES OF STEAMSHIP COURIER.

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17·548 knots was obtained. The engines ran smoothly and well, indicating 2,979 horse power, the revolutions being 124 per minute and the vacuum 26·5 inches.—*Engineering.*

How to Abolish Beggary.

A correspondent of one of our contemporaries recently asked United States Senator Stanford, of California, what could be done in this country to abolish beggary. The answer of the philanthropic millionaire was as follows:

There is only one way. Dry up the source—abolish the conditions that make beggars. To try to cure poverty by street charity is like trying to stop a hole in your roof by mopping up the puddles that gather on your floor. Nobody is worse off because the Vanderbilts are worth $200,000,000. If they had not the wealth it would not exist at all. It is only in those communities where millionaires are possible that the average citizen has enough to eat. Now, what causes poverty? 1. Ignorance of how to save money. I found beggars in California in 1850, when any man could go out with a tin pan and earn $5 before breakfast. When by working three hours a day a man could make his board and clothes, there were always shiftless creatures around whom the rest had to support. It is the same way now. The soil is wonderfully fruitful there. Merely 20,000 men produce all the wheat of the State and export 1,000,000 tons of it every year, and yet there are beggars. We can cut, thrash, and sack wheat at an expense of one and a half cents per 100 pounds, potatoes cost only a half a cent a pound, and flour is only $4 a barrel, and yet there is want. An important cause is unthrift. People do not understand economy or practice it as almost every rich man has had to some time in his life. I really believe that there would be beggars in the world before night if $20 gold pieces were to be sown broadcast every morning, and so distributed that every man, woman, and child were certain to get some.

2. The sale and use of liquor. As long as there are ten times as many saloons in this country as there are of both churches and schools, and they are mainly supported by the very poor, the sources of misery are pretty obvious.

3. A lack of manual training. This last need is most serious. If so many people could be taught trades that the entire product of this country were doubled next year, the wages would be doubled, either in increase of money received or in the smaller cost of the necessities of life to be bought. More capable, skilled hands—that is one of our greatest needs. My great hope is in my university, which I wish to build so tall and deep and broad that the rudiments of every trade and occupation may be taught. When everybody knows how to do some difficult and useful thing, poverty will rapidly diminish.

Bursting of a Great Gun.

An Armstrong breechloading gun recently burst at the Royal Arsenal. The officials represent the occurrence as merely one of a small percentage of failures which are always expected in the course of the proof trials; but the great size of the weapon, which was a 10 inch gun of about 38 tons weight, gives prominence to the accident, and the fact of several rounds having been fired before the burst took place points to some cause beyond a mere flaw in the material, which the first test ought to have revealed. The chase or barrel of the gun was blown clean out of the chamber end, and fell in one piece to the ground.

Calcimine and Its Varied Tints.

The season for renovating the interior of our dwelling houses is near at hand, and some of our readers may wish to prepare their own calcimine. We give the following rules for the purpose of enabling them to do so:

Soak one pound of white glue over night; then dissolve it in boiling water and add twenty pounds of Paris white, diluting with water until the mixture is of the consistency of rich milk. To this any tint can be given that is desired.

Lilac.—Add to the calcimine two parts of Prussian blue and one of vermilion, stirring the mixture tho roughly, and taking care to avoid too high a color.

Brown.—Burnt umber.

Gray.—Raw umber, with a trifling amount of lampblack.

Rose.—Three parts of vermilion and one of red lead, added in very small quantities until a delicate shade is produced.

Lavender.—Make a light blue and tint it slightly with vermilion.

Straw.—Chrome yellow, with a touch of Spanish brown.

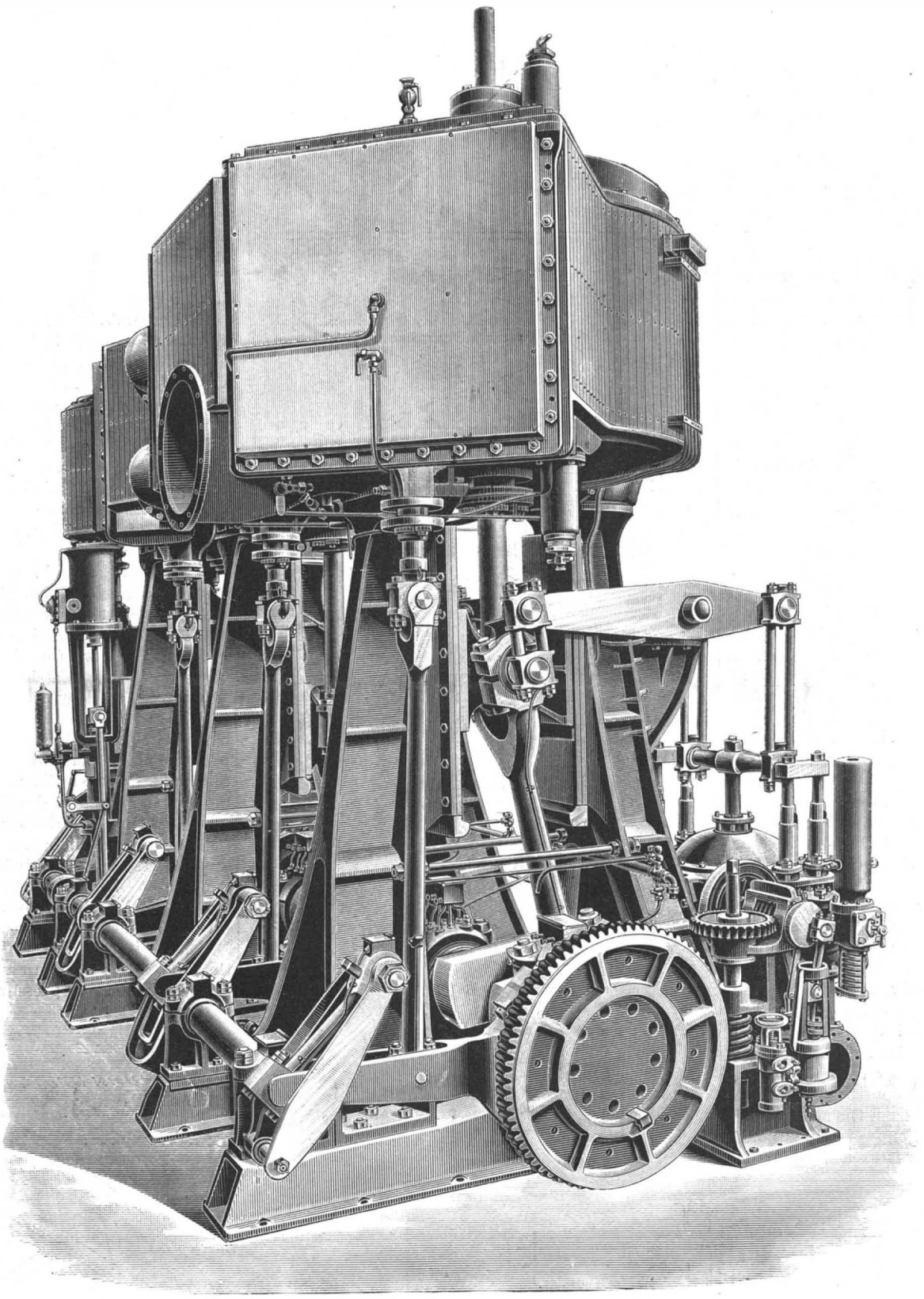
Buff.—Two parts of spruce, or Indian yellow, and one part of burnt sienna.

Blue.—A small quantity of Prussian blue will give a soft azure tint. Dark blue is never desirable.

Delicate tints in the foregoing varieties of colors are always agreeable and tasteful, and so great care must be taken that they are not too vivid. The tints will always appear brighter than in the calcimine pot, and the workman or workwoman must keep this fact in mind when adding the coloring powders. It is a good idea to give the ceiling a calcimine two or three shades lighter than that of the walls, so that it may seem merely a delicate reflection of their deeper tones. The ceiling can be calcimined with the lighter tint, and then more coloring added for the walls.

Timber Forests in Siam.

The Hon. Carter Harrison, ex-mayor of Chicago, is giving some attention to the timber interests during his tour around the world. In a recent letter from Bangkok, Siam, copied in the *Lumberman*, he says: "A large amount of logs are floated down the Menam and sawed at Bangkok. But so difficult is the getting of logs to the river, there being absolutely no kind of roads, that the timber sells here at about 60 cents a cubic foot. And yet I am assured there are vast quantities of this timber rotting in the forests within comparatively short distances from the streams. The people are so utterly lazy that their labor can never be depended upon to build roads or in any way to develop the resources of the land. Foreign energy and capital must be called into requisition. The great teak and ebony forests are several hundred miles from the coast. These are so dense that the superintendent of the construction of telegraph, Mr. Fritz—an American—consumed two or three months in cutting a way for a line through a forest of sixty-five miles. There was an advance party of some five hundred natives cutting the trail, and a second party of one hundred and seventy putting up the poles and wire. Elephants were used for all carrying. So terrible was the jungle fever, that in that one jungle some two hundred and fifty natives died within two months. If a dose of twenty grains of quinine failed to break the fever, death almost immediately ensued."



TRIPLE EXPANSION ENGINES OF STEAMSHIP COURIER.

Cloud Indications.

M. Camille Flammarion has recently published a little book on meteorological observations, from which *La Genie Civil* makes some interesting extracts, on the subject, more particularly, of weather predictions. Most people know that a fall in the barometer indicates the approach of a storm, and a high barometer indicates fair weather; but more than this may, according to M. Flammarion, be learned from the mercury column. When, he says, clouds are to be seen moving in a long line, whatever may be the height of the barometer, it may be taken as certain that a depression or storm center exists in a direction which may be readily ascertained by facing in the direction in which the clouds are moving, and extending the left hand. On land, the position of the storm center is of no great importance, except, perhaps, as showing whether it will cross a given locality, but at sea it is often possible for a captain, after finding in what direction the most violent part of a storm lies, to steer away from it, and soon bring his ship into pleasant weather. As to the distance and seriousness of the storm, something may be learned from the velocity with which the procession of clouds move; a severe and near storm being always indicated by a swift cloud movement and a high barometer.—*American Architect.*

The Sinking of the Cordillera of the Andes.

The Cordillera of the Andes has for some time been exhibiting a curious phenomenon. It results from observations made upon the altitudes of the most important points, that their height is gradually diminishing. Quito, which in 1745 was 9,596 feet above the level of the sea, was only 9,570 feet in 1803, 9,567 in 1834, and scarcely 9,520 in 1867. The altitude of Quito has, therefore, diminished by 76 feet in the space of 122 years. Another peak, the Pichincha, has diminished by 218 feet during the same period, and its crater has descended 425 feet in the last 25 years. That of Antisana has sunk 165 feet in 64 years.—*La Gazette Geographique.*

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A DEFECTIVE CEILING IN THE CAPITOL BUILDING, ALBANY, N. Y.

Probably the most expensive and gorgeous State Capitol building in this country is that at Albany, N. Y., upon which almost fifteen millions of dollars have already been spent, and it is not yet finished. It is a magnificent structure of noble design. But there are evidences of bad work, poor engineering skill, and lack of proper supervision during the construction of some portions of the edifice.

The Assembly chamber is one of the noblest auditoriums, grand in general appearance. Its ceiling of stone is supported on groined arches. An unfortunate settlement of the adjacent walls, which has for some time been going on, has of late made such further progress as to endanger, as was believed, the lives of the members of the Assembly when in session. The ceiling was regarded as liable to fall at any moment.

Immediately upon the assembling of the Legislature, early in January, the members began to be annoyed at the renewed reports in regard to the unsafety of the ceiling. Their fears continued to grow upon them until finally they moved into the Assembly parlor and voted an appropriation to allow the temporary "shoring up" of the vault by the Capitol Commissioner, Mr. Perry.

The Assembly chamber has extreme dimensions of 140 by 84 feet. It is, to use the terms of Gothic architecture, a nave of five bays with an aisled transept. The extreme length is shown in the gallery floor and at the ends of the nave. Each of these extreme spaces is a public gallery. What would be the last bays of the aisles on either side of them are walled out of the room altogether. The spaces under them are vaulted lobbies. The squares at the corners of the central space are also separated from the main room on the first floor, at the Speaker's end by a solid wall, and at the entrance end by columns carrying a stone screen, and each contains a gallery. The Assembly chamber proper is thus confined to the central transept, including the bays at either end, in one of which the Speaker's desk, shown in our engraving, is placed. The space bounded by the columns is 45 by 55 feet, nearly, and the keystone of the vault over it, the highest point of the room, is 62 feet from the floor. The ridges of the vaults are not horizontal, but have a rise in the central vault of three or four feet in the center. There are no ridge ribs and no wall ribs, the coping abutting directly upon the walls. The shafts of the four colums which support the central vault are four feet in diameter, composed each of three drums of red Connecticut granite, polished. The capitals and bases are of Westchester marble. The walls and cells of the vaults are of Ohio sandstone, with ribs and arches of Dorchester stone. The nook shafts of the windows are of brown stone from New Jersey, with capitals and bases of Ohio stone. The hood moulds of the windows are of brownstone, the voussoirs of Ohio stone, the archivolts within them, and the impost mouldings, of Dorchester stone. The moulding of the arches and ribs of the vault, and of the jambs, wall arches, and other features, is bold and simple in character, rather than delicate or complicated, and the decorative carving is throughout highly conventionalized from natural types in design.

The carved enrichment of the Assembly chamber is abundant, and incised arabesques are freely introduced, as well as modeled carving. The color decoration is everywhere a part of the carved decoration. Each groin of the ceiling bears two belts of decoration, one almost at the ridge, the other not far from the springing, which follow the line of the courses. The ornament in the upper belt, fifty feet from the spectator, is very bold in design and cut; the lower belt subordinate in all respects. The stone is excavated to the depth of some inches, and the ground filled with vermilion or ultramarine, the ornament edged with gold. The furniture of the room is mahogany. On the north and south walls of the chamber are the famous frescoes "The Discoverer" and the "Flight of Night," by William M. Hunt.

The chamber, as described above, is not the one that was originally designed. The ceiling of that one was to consist of panels of cast iron at a height of forty-two feet from the floor. In 1875 the Legislature abolished the Board of Capitol Commissioners and placed the work in the hands of the lieutenant governor, the attorney general, and the auditor of the canal department. When it was proposed to change the entire form of the Assembly chamber and load the weight of the ceiling upon the four great columns, the original architect, Mr. Thomas A. Fuller, resigned; and the Board put Mr. Leopold Eidlitz and the late Mr. Richardson in charge of the work. Mr. Edlitz proceeded to construct the Assembly chamber as it was finally built.

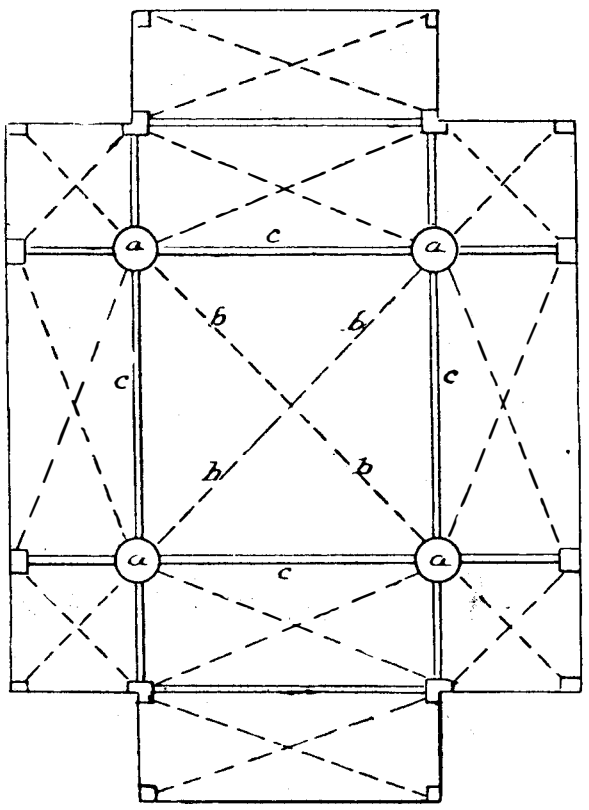
There appeared to be no feeling of insecurity until 1881, when a resolution asking for an investigation was defeated in the Senate. In 1882 a report was made to Gov. Cornell by a special commission consisting of W. P. Trowbridge, Chas. Babcock, and George B. Post, who reported that the workmanship of the building was, as a general thing, very thorough; but in the Assembly chamber they found that the four great columns were loaded to the extreme limit of safety; that the stone of which the ribs were constructed was not uniform in quality or strength; that the side vaults had a tendency to rise; and that the main arches were in good condition, although the transverse thrusts had been taken up by iron rods at points above the crowns of the main arches. Therefore the commissioners, being uncertain as to whether the columns had settled as much as they would, recommended that the stone vaulting be removed and be replaced with wood, the stone ribs still remaining. Mr. Eidlitz asked that he might repair the broken ribs at his own expense, and nothing more was done, except to all ow himto do so.

Examinations at that time showed very large cracks through which the room below could be seen. The Assembly, therefore, was obliged to meet in the room beneath, for a few weeks in the early part of the year 1883. When these repairs were concluded, the Assemblymen sat under the ceiling for four years without anything more than an occasional attempt to have some one investigate and report upon the alleged danger. By 1887, however, there was alarm. An engineer was employed to make a thorough examination. He reported there were many new fissures in the ribs, and the ceiling must come down and be replaced with a lighter one of wood. This report was not made until the end of the legislative session. Hence nothing was done during that year.

The commissioners appointed to make a preliminary examination, early in last January, were John Bogart, state engineer, Richard Upjohn, architect, and Thomas C. Clark. Early in February they made a report which contained, among others, the following statements: "We went up to the top of the ceiling, and found there had been many serious movements of the stones of the groined vaults, owing to the vaults and ribs not acting together. This has caused cracks at the joints, in some cases of considerable length. In one place, at the apex of the ceiling, the Assembly floor can be seen through the crack.

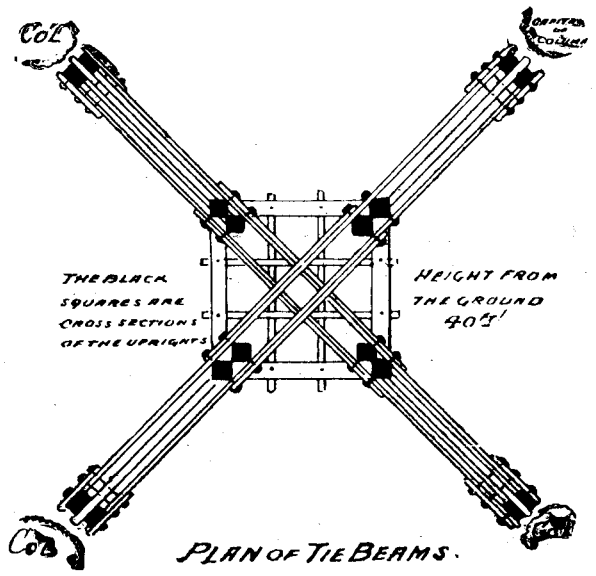
We found the main vault in two places had settled three inches below its original level. All the main ribs which support the central vault were found to be cracked and shattered near the circular keystone. In one of the ribs we found a stone three feet long split from end to end in strips. By the side of another rib was a spall, split by pressure, 10½ inches long, 7 wide, and 3½ thick. Its defect was not due to the material. There is clear evidence of sound sandstone split by a pressure many times what it had been calculated to sustain. The whole ceiling is in a dangerous condition, more or less cracked, showing signs of unexpected pressure. As the ribs originally were none too large to resist pressure, in their present reducing condition they are still less able to do their work. A time must come, and that we believe very soon, when without warning one or more of these overtaxed rib stones must give way. When that happens, the whole ceiling will fall."

A more thorough examination established the fact that the ceiling is not in a state of equilibrium, that is to say, the excess of pressure in one part, as at the base of the arches that spring from the southeast column tends to press upward all the ashlars—or what is called the "vaulting"—on whatever plane it may be laid. There was formerly just as much trouble with the rising of the arches that spring from the other three pillars; and the central dome showed a very bad disposition to rise, which was only corrected by placing upon it many tons of pig iron to load it down. The arches that spring from the four great columns are

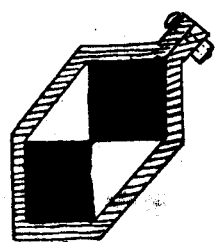


a. The four columns. *b*. The diagonal ribs that need support. The light ribs are all dotted. *c*. Heavier ribs.

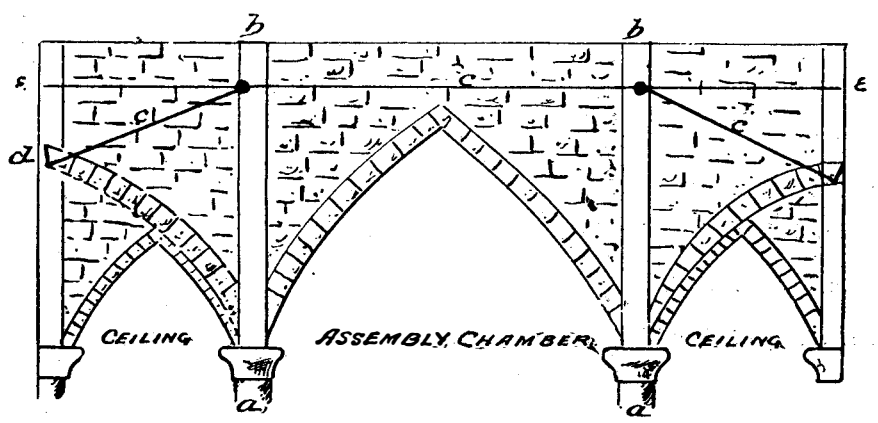
PLAN OF ASSEMBLY CHAMBER CEILING.



PLAN OF TIE BEAMS.

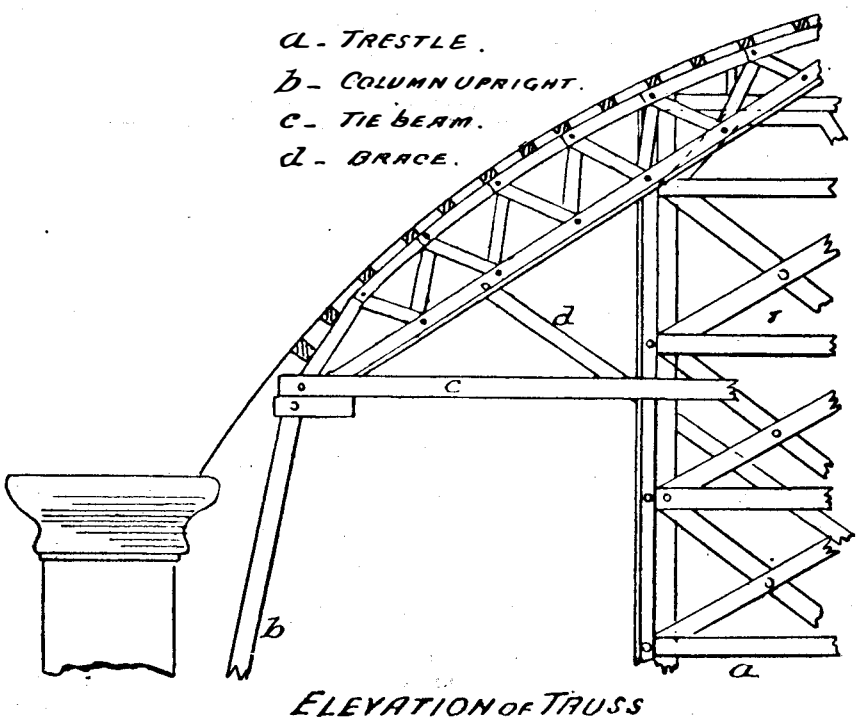


How bolted (cross section).



SECTION OF THE EAST & WEST WALLS.

a. Two of the great columns. *b*. The cross walls, north and south. *c*. The tie rods. *d*. The granite arch (hidden by a veneering of sandstone) holding the anchorage of the tie rods and receiving the thrust of the main arch. *e*. Extra tie rod in north and south walls.



ELEVATION OF TRUSS

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surmounted by walls that reach a level of five feet above the respective keystones. The walls are carried beyond the columns into solid walls beyond. Just above each of the four great arches that connect the columns (and embedded in the solid masonry) there run straps of iron 3 inches broad and 1½ inches thick. Four of these straps are laid side by side, thus forming tie rods, which are anchored in the solid wall beyond. Thus each of the four columns is crossed at right angles by tie rods some distance above its capital. This will be shown more clearly by the accompanying section of the two east and west walls. The dotted lines at *d* show the hidden granite arch that receives the thrust from the main arch and keeps the four great columns from being pushed outward. As the tie rods expand in the summer, the arches drop a trifle. When they contract with colder weather, the arches will not rise, but spalls will chip off. This process has been going on for years, and it has beena source of great danger. These spalls which fall to the floor almost invariably appear when there is a considerable change in the temperature outside—in October and November. The staging that is in place now enables the visitor to examine closely the under surface of the ceiling. The dropping of the central keystone has pulled the ashlars away from the west walls, and has left great gaps, which were filled four or five years ago. At the same time many defective places caused by the dropping of spalls were pointed, so as not to appear from the floor. A closer examination shows that the ridges along the main vault are so thoroughly crushed that it is a wonder the broken stone did not fall long ago. The diagonal ribs of the great vault show many cracks, which prove they were made of too light material. The fact is, they should not only have been made of better material, but they should also have been three or four times as large.

The Capitol Commissioner, Mr. Perry, saw at once that these diagonal ribs must be supported. In this he did not agree with some who had thought that the ribs connecting the four great columns should be strengthened. Mr. Perry's first movement was to cut through the floor in four places near the center of the room, so that he might strike two columns in the floor below; and, for his other two foundations, go to the solid bases one story lower. Thus he had a parallelogram 18 feet one way and 12 feet the other. He placed on the corners sticks of Georgia pine 12 inches square as the uprights for the trestle. These sticks were reenforced by sticks of the same size placed edge for edge toward the interior of the parallelogram—the two being bolted by straps of iron. The trestle was continued all the way to the keystone. Excavations were made about the bases of the four great columns and heavy foundations of wood were laid, on which two uprights (each 12×12) were placed, with the inclination toward the great trestle in the center. When these uprights had passed above the capitals of the columns, they were met at right angles by great tie beams, which braced them into the central trestle. Having thus prepared a strong framework, it was a comparatively easy matter to construct four trusses running from the top of each column upright to the nearest corner of the central trestle. In the placing of the trusses, a chord was first run in a straight line. Then a rib, in very small sections, was built along in the curve about 6 in. for the stone rib of the ceiling above. The last of the work was to connect the ribs and the chords by the struts, or cross pieces.

The whole work has been an undertaking of great difficulty. It supports the ceiling so that there is no possible danger, and, at the same time, the support is so permanent that it can be used when the ceiling is finally removed. The chances are that it will be succeeded by one of wood or of iron. In either case it is probable that the pointed Gothic arches will not be repeated; but that Romanesque arches will be used, in harmony with the windows and doors, thus lowering the height of the room from 12 to 15 ft., and much improving its acoustic properties.

A New Treatment for Boils and Carbuncles.

In a communication to the French Academy of Medicine, at a recent meeting, M. Verneuil says:

The topical applications (prominent among which stand the carbolated and borated solutions) employed in a certain way, and particularly in the form of powder used repeatedly and for a long time, are of remarkable efficacy, and at the same time are absolutely harmless and easy of application.

These applications of powder quickly abort, with very few exceptions, boils and carbuncles. They arrest the progress of the disease in the gravest cases, ordinarily cause the pains to quickly cease, reduce the fever, disinfect the purulent and gangrenous centers, hasten resolution, and promote the formation of healthy granulations.

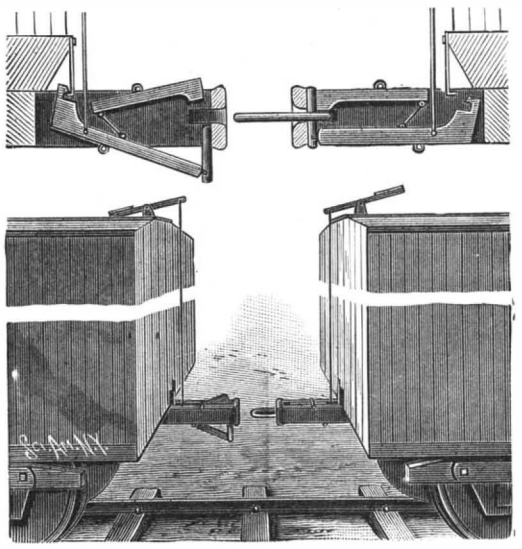
This treatment is suitable for all regions, and for all forms and periods of the disease. It is never harmful, and leads to a cure in a large number of cases. It assists surgical interference when that is necessary.

Finally, it tends to prevent auto-inoculation and general infection.

AN IMPROVED CAR COUPLING.

A car coupling in which a lever operated by a foot lever on top of the cars carries the coupling pin, a guide lever being connected with this lever, and a spring catch for holding it in place, is illustrated herewith, and has been patented by Mr. William H. Dawson, of Harlan, Iowa.

The manner in which the lever is fulcrumed to hold the coupling pin is plainly shown in the sectional view, the inner end of the lever being formed with a catch to engage a spring by which it is held in a locked outward position, and there being secured to the lever, in front of its fulcrum, a link connected with the rear end of a guide lever fulcrumed on the drawhead, and also moving in the vertical slot in which the coupling pin slides. The front end of this guide lever has a shoulder adapted to engage the inner end of the coupling link, to guide it to place when entering the other drawhead. When the fronts of the two drawheads come together, the catch is disengaged from the lever holding the coupling pin in the open drawhead, and as the cars are coupled the shoulder of the guide lever engages the top of the coupling link, locking it in place. To uncouple the cars, it is only necessary to press with the foot on the inner end of the foot lever on top of the car.

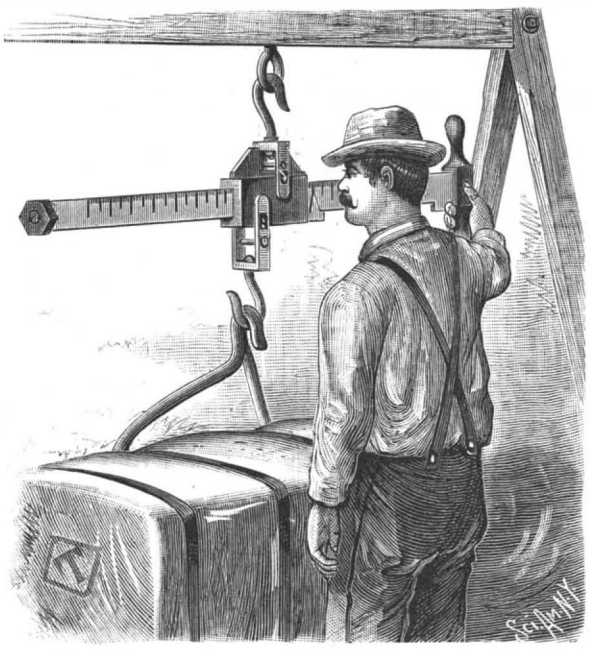


DAWSON'S CAR COUPLING.

AN IMPROVED WEIGHING SCALE.

A device to facilitate the convenient weighing of a wide variety of articles, and which has but few parts and can be economically constructed, is shown in the accompanying illustration, and has been patented by Mr. Waddy C. Thomson, of Lancaster, S. C.

The scale beam is arranged to slide in a suspended piece or box, so that at every sliding or shifting one end of the beam will project more and the other end less from the point of suspension. The weight is a constant, permanently fastened to the sliding beam, there being a larger weight attached to one end and a smaller one at the other end, both weights and beam adding to the capacity of the scale. Removable weights are not required, with their liability to being mislaid or dropped on one's feet. The top buffer, with the hanger, limits the swing of the beam, showing down or up weight. A fixed stop or buffer on the under side of the beam limits the sliding of the beam to the left, and protects the fingers from being mashed when the stop comes against a projection from the bottom of the box, the scale then being in equilibrium when no object is being weighed. To this projection is attached a pointer, indicating the weight on the graduated beam as it is moved in or out, the scale balancing with the weights. The weights cannot be tampered with without the scale indicating it. This invention is applicable to a variety of scales.



THOMSON'S WEIGHING SCALE.

The Care of the Eyes.

At the sanitary convention held at Ann Arbor, Mich., not long ago, Dr. C. J. Lundy, of Detroit, read a paper on "Hygiene in Relation to the Eye," which should have the widest circulation, especially among teachers and school officers. A fruitful source of eye troubles is shown to be the excessive strain upon the muscles and nerves of the eyes due to faulty educational methods, the ill planned and insufficient lighting of school rooms, poor ink and fine print in school books, and other causes which education might correct.

In conclusion, Dr. Lundy lays down the following rules for the better care of the eyes:

1. Avoid reading and study by poor light.
2. Light should come from the side, and not from the back or from the front.
3. Do not read or study while suffering great bodily fatigue or during recovery from illness.
4. Do not read while lying down.
5. Do not use the eyes too long at a time for near work, but give them occasional periods of rest.
6. Reading and study should be done systematically.
7. During study avoid the stooping position, or whatever tends to produce congestion of the head and face.
8. Select well printed books.
9. Correct errors of refraction with proper glasses.
10. Avoid bad hygienic conditions and the use of alcohol and tobacco.
11. Take sufficient exercise in the open air.
12. Let the physical keep pace with the mental culture, for asthenopia is most usually observed in those who are lacking in physical development.

A Mammoth Aphengescope.

The *English Mechanic* describes what it calls a mammoth aphengescope which has just been devised and constructed by Mr. W. C. Hughes, of Mortimer Road, Kingsland, for Princeton College, New Jersey. The object of the apparatus is to show diagrams, solid objects, such as machinery, the human face, and anatomical and other subjects occupying a large space, on a larger scale than has ever yet been attempted. The idea of an opaque lantern is, of course, not new, but hitherto the loss of light reflected has been an insuperable difficulty, which Mr. Hughes has overcome by constructing condensing lenses of larger diameter and special curvature, the object lens being of a very special character, being 8 inches diameter, and therefore very costly. In days gone by, the size of the largest object that could be shown was that of a carte-de-visite or watch face, but with this new instrument an object occupying 24 to 30 inches square can be shown on a disk of from 12 to 18 feet. To obtain these results the expenditure of no inconsiderable amount of money and numberless experiments have been necessary, extending over a period of more than eighteen months. After all this labor it is gratifying to find that the invention is a complete success, many scientists having expressed their approbation and approval, among others Mr. William L. Carpenter, B.A., who was commissioned to test the capabilities of the instrument, and whose verdict is that he has never seen so fine a result from reflected light.

Waxing Hard Wood Floors.

Take a pound of the best beeswax, cut it up into very small pieces, and let it thoroughly dissolve in three pints of turpentine, stirring occasionally if necessary. The mixture should be only a trifle thicker than the clear turpentine. Apply it with a rag to the surface of the floor, which should be smooth and perfectly clean. This is the difficult part of the work, for if you put on either too much or too little, a good polish will be impossible. The right amount varies, less being required for hard, close grained wood, and more if the wood is soft and open grained. Even professional "waxers" are sometimes obliged to experiment, and novices should always try a square foot or two first.

Put on what you think will be enough, and leave the place untouched and unstepped on for twenty-four hours, or longer if needful. When it is thoroughly dry, rub it with a hard brush until it shines. If it polishes well, repeat the process over the entire floor. If it does not, remove the wax with fine sandpaper and try again, using more or less than before, as may be necessary, and continue your experimenting until you secure the desired result. If the mixture is slow in drying, add a little of the common "driers" sold by paint dealers, japan, for instance, in the proportion of one part of the drier to six parts of turpentine. When the floor is a large one, you may vary the tedious work of polishing by strapping a brush to each foot and skating over it.

WE are glad to know that our correspondent Wm. R. Brooks, of Red House Observatory, Phelps, N. Y., has just been elected a Fellow of the Royal Astronomical Society of England, in recognition of his astronomical discoveries.

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Trade Mark Difficulties.

The new English trade mark law makes it incumbent on the customs authorities to stop the import and also the export of any goods which they think bear wrongful trade marks. The officials have been carrying out their duties with such a high hand as to occasion loss and inconvenience to merchants. A large public meeting was lately held in London with a view to measures for the amendment of the act. All sorts of well known names, it appears, are registered in England as trade marks, and consequently almost any species of goods made by outsiders is liable to be seized by the customs for infringement.

Several amusing instances were cited of goods being stopped by the customs, including a consignment of bacon from America, because the boxes, though bearing the name of the town whence they came, were branded "mild cured;" a package of albums, because the word "album" (it was said) was English; and a case of thermometers, because they were marked "Fahrenheit." The following amendment was proposed by Mr. Platnauer and seconded by Mr. Moenich:

"That steps be taken by the Chamber of Commerce to influence the treasury to permanently remove the petty restriction placed by the custom house officials in the way of the equitable operation of the act, without in any way interfering with the trade marks or the resemblance to those marks such as would lead the public to suppose that they were articles of English manufacture."

A FAMILY at Versailles, France, consisting of the parents and two children, were poisoned with conium, which had been used instead of parsley in a dish of vegetables. The patients, being dangerously sick, were taken to the hospital for treatment, and recovered. A variety of conium much resembling parsley grows in all the back yards and gardens in Versailles.

THE FRENCH EXHIBITION OF 1889.

The greatest activity now prevails in Paris in respect to the preparation of the buildings for the International Exhibition of 1889, which promises to be by far the most wonderful and interesting industrial assemblage ever brought together. We give, on page 152, a condensed map of the locality, which we find, with some particulars, in *Engineering;* also additional views illustrative of the great one thousand foot tower, from *Le Monde* and other journals.

M. Georges Berger, the Director-General of the Paris Exhibition of 1889, has issued an official block plan of the buildings and grounds, together with some general information intended especially for the use of foreign exhibitors. Annexed is a copy of the plan referred to, from which it will be seen that the exhibition is contained within one continuous inclosure, comprising:

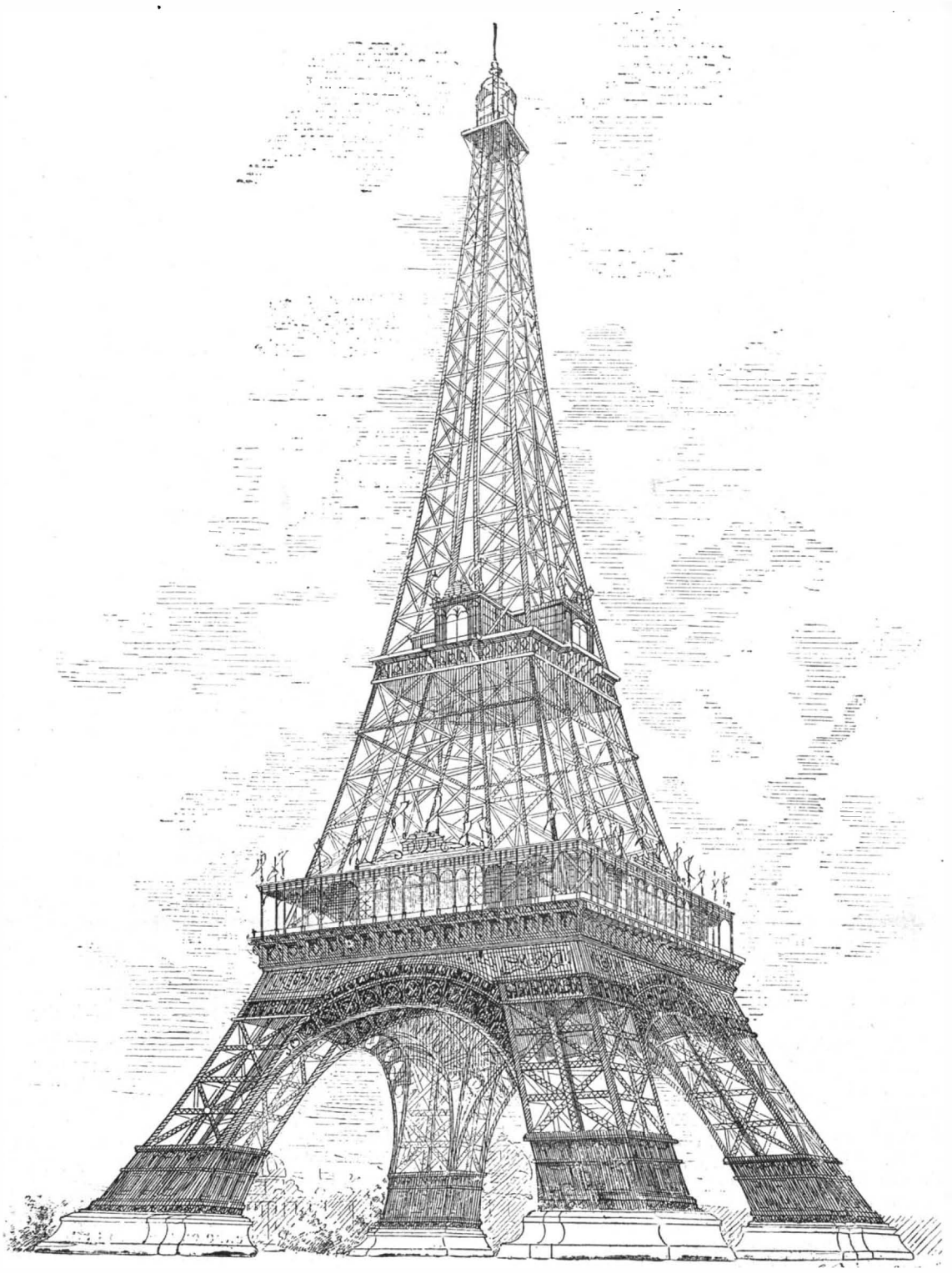
1. On the left side of the Seine: The Champ de Mars and the river quays and banks; the Esplanade of the Invalides and that part of the Quai d'Orsay between the Esplanade and the Champ de Mars.

2. On the right bank of the Seine: The park and certain available portions of the Trocadero Palace. The Pont de Jena, connecting the Trocadero and the Champ de Mars is also included. The exhibition will be divided into four principal parts and nine groups, as follows:

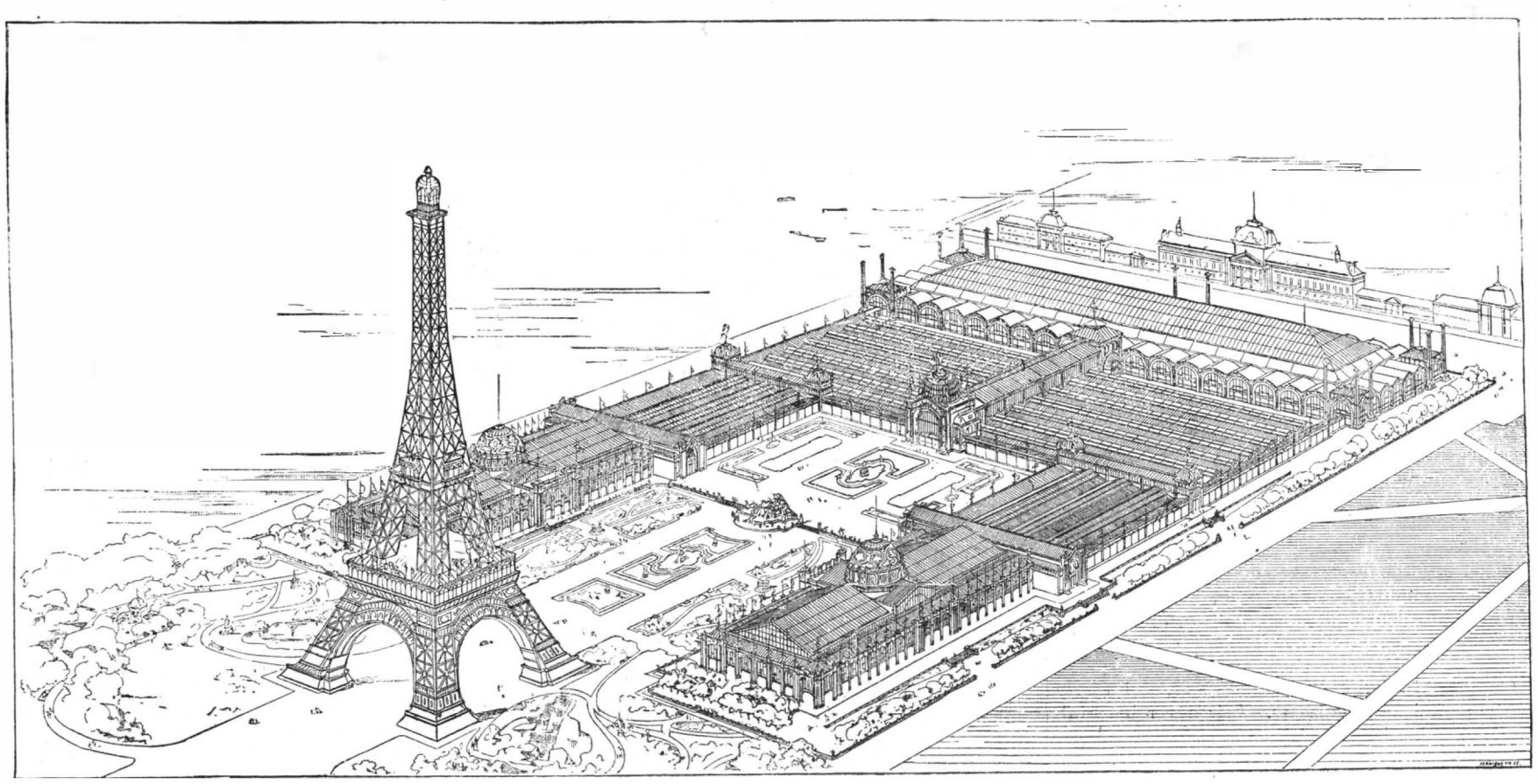
Part I.—The Champ de Mars. (A.) Section I. The Fine Art Buildings: Group 1. Sculpture, paintings, etc. This building will be divided into galleries and groups of galleries, corresponding to the various national exhibits.

Section II. (B.) Liberal Arts: Group 2. Education; materials and processes connected with the liberal arts. This building will comprise a great central nave and galleries, and the space will be divided into two parts, distributed by classes, one for French, the other for foreign exhibits.

Section III. (C.) Gallery of miscellaneous industrial products, comprising: Group 3. Furniture and accessories. Group 4. Fabrics, clothing, and accessories. Group 5. Extractive industries; raw and manufactured products. The area of this gallery—about 100,000 square yards—will be divided into three parts, one being allotted to each group. Each part will be subdivided into two, of which one, reserved for French exhibits, will be divided into



M. HANIN'S PERSPECTIVE OF THE GREAT TOWER.



THE FRENCH EXHIBITION OF 1889—DIAGRAM OF GREAT TOWER AND BUILDINGS.

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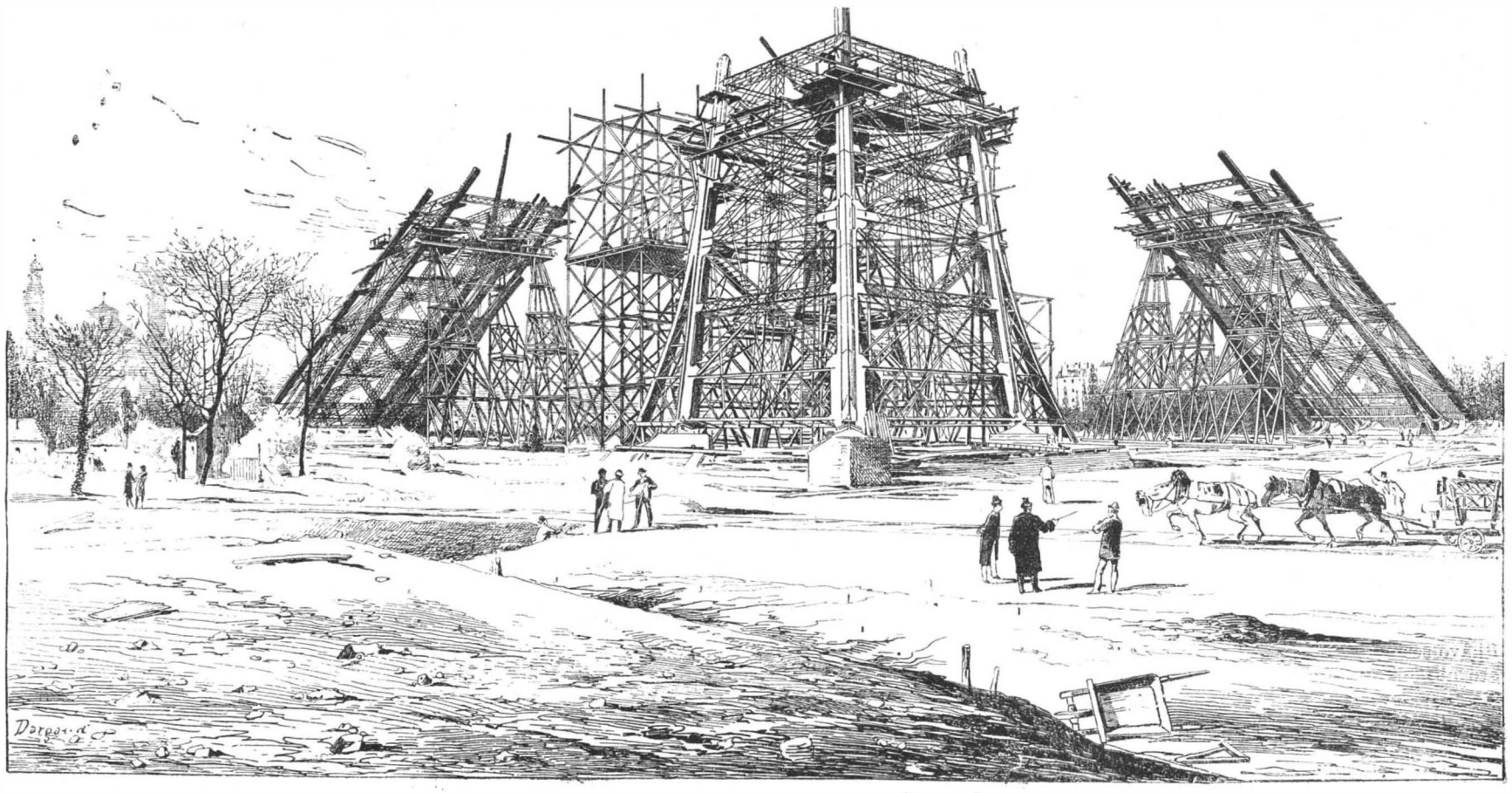
classes, and the other for foreign exhibitors into nationalities.

Section IV. (D.) Machine Galleries: Group 6. Machines and processes connected with mechanical industries; electricity, This building will be divided into classified sections, in each of which the similar exhibits of different nationalities will be arranged, as far as the available motive power will permit.

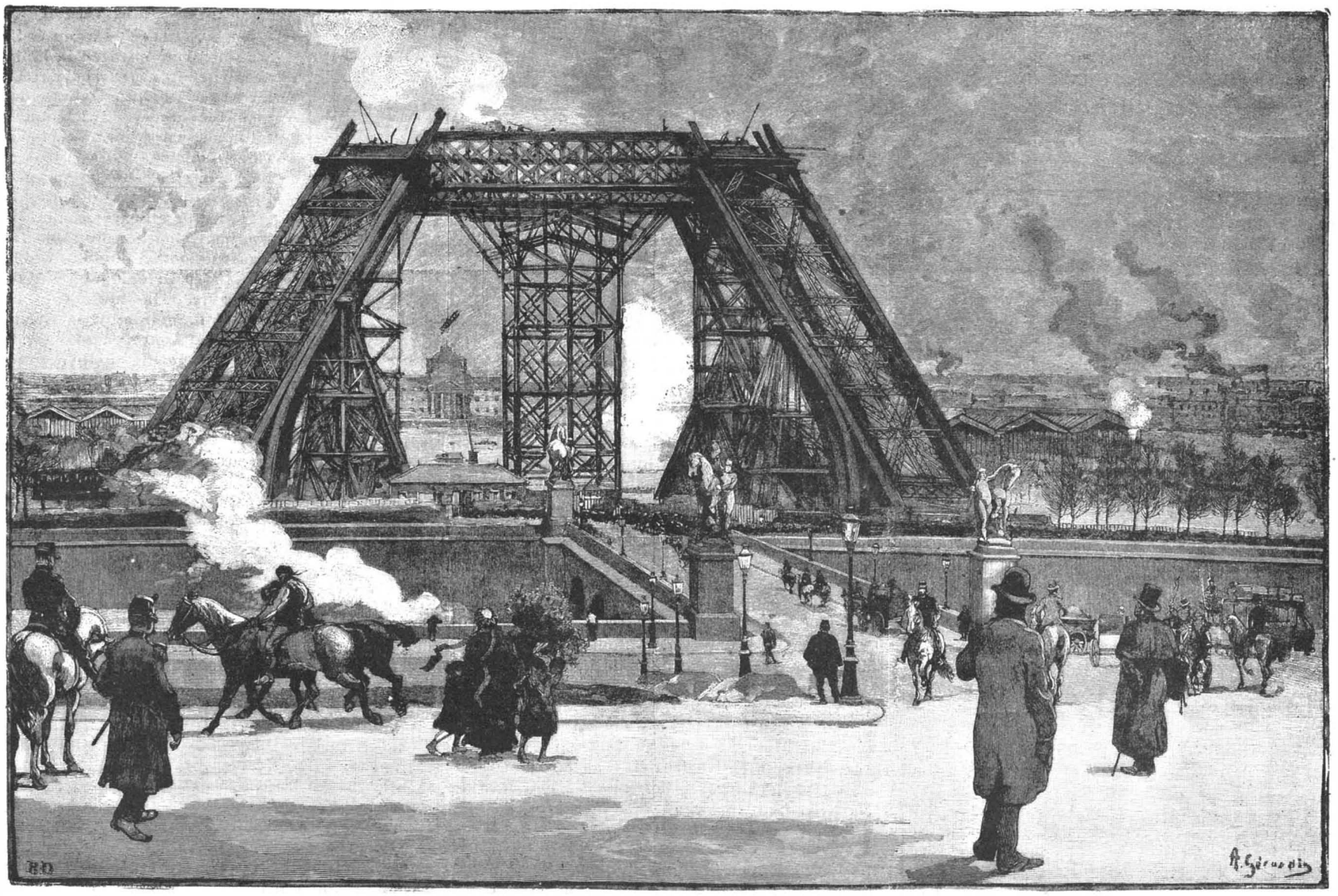
Part IV.—The Trocadero. (K.) International exhibition of horticulture and agriculture, comprised in Group 9, horticulture.

The available spaces allotted to the respective groups for French and foreign exhibitors have been estimated from the statistics of previous great exhibitions. Those of 1867 and 1878, held in Paris, had for their principal feature the construction in the Champ de Mars of a palace, the galleries of which, arranged either circularly or in straight lines, permitted the French and foreign exhibits to be so arranged that visitors could inspect at will all the objects in the same group coming from different nationalities, or all the products of each nationality. This scheme involved for each country the allotment of a special and well defined space. It was very successful in 1867, although the relegation of French and foreign agricultural exhibits to a separate building was a departure from the ruling idea. In 1878 it was intended to follow the practice of 1867, but the great number of exhibits rendered it impossible. By the system adopted for 1889 a methodical order of division has been substituted for the old plan.

The following information will be useful to foreign exhibitors. The administration makes no charge for space, but exhibitors will incur the cost for subdividing such space with the necessary partitions, for flooring, finishing and decorating their allotments, according to general plans furnished by the administration, and of course for installing their exhibits, and also for the service of cleaning and special watchmen. French and foreign contractors will be invited to tender for furnishing the motive power required to drive the machinery in motion. The conditions under which such tenders must be made are already formulated. Arrangements have been made with the French railway companies, the Compagnie Generale Transatlantique, and the Compagnie des Messageries Maritimes, by which the cost of transport on all objects for exhibi-



THE FRENCH EXHIBITION OF 1889—THE INCLINED BASE COLUMNS OF THE GREAT TOWER.



THE FRENCH EXHIBITION OF 1889—PRESENT APPEARANCE OF THE TOWER.

Part II.—The Quai d'Orsay. (E.) Section I. Group 7. Food products. These will be arranged in a building of more than one story, the international exhibits being classified collectively.

Section II. (G.) Agricultural exhibits. Group 8. Agriculture, vine culture, and pisciculture.

Part III.—Esplanade des Invalides. This area will be devoted to the exhibition of trees, etc., and will form an annex to Group 8. Also to miscellaneous exhibits from French colonies, to special exhibits of the French ministries, to social economy, hygiene, etc.

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tion (except works of art and articles of special value) shall be reduced 50 per cent. So far as is possible and under the most economical conditions, the administration will place at the disposal of exhibitors men and appliances for unloading and unpacking cases, as well as for repacking at the close of the exhibition. The exhibition will as usual serve as a bonded warehouse, so that goods exhibited will not be subjected to octroi or other dues, unless they are sold. A general and comprehensive French catalogue will be published, but sectional catalogues may be issued for the exhibits and in the language of each nation taking part in the exhibition.

M. Hanin sends to *La Construction Moderne* the accompanying drawing, as he thinks it will appear, of the great tower, which is to form one of the remarkable objects of the exposition of 1889.

M. Hanin says: "This perspective is taken from the quay at Passy, the spectator being 1,000 ft. from the axis of the tower.

"I have not drawn it in the ordinary manner (intersection of the visual lines on a vertical plan), which has the fault of preserving the geometrical proportions of the height; but I have determined the relative dimensions of the different parts by the usual angle in which they are included, so as to realize as exactly as possible the proportions and aspect which the tower will present to a spectator located as above mentioned.

"The view of the palace of the exposition is determined in the same manner. The scale of my drawing is 0·005 millimeter to a degree, and for my geometrical dimensions I took as a basis the autography of 0·002 per meter as recently published.

"In general, the various perspectives I have seen up to the present time are absolutely false, and certainly tend to form a bad opinion of this work, which I believe, on the contrary, will be very interesting. However, I consider the structure as badly located, for the palace of exposition will be assuredly dwarfed by the presence of this enormous tower in the foreground. I should have preferred to place it on the background, near the Ecole Militaire. The palace of the exposition in the foreground would have been less eclipsed."

How to Utilize a Cypress Swamp.

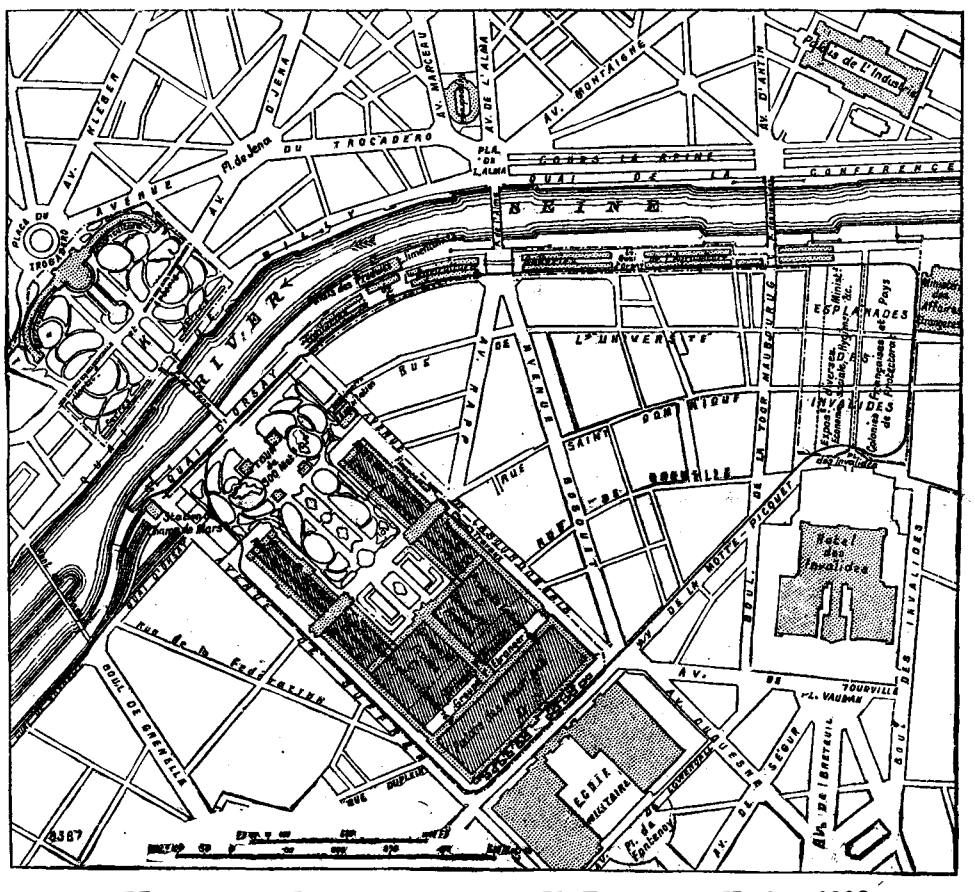
The readers of the *Lumberman* have been made aware that R. G. Peters, of Manistee, and Horace Butters, of Ludington, Mich., were interested in North Carolina cypress, having purchased 100,000 acres of land largely timbered with that kind of wood. Their holdings are in Robeson County, N. C., and to some extent in that part of South Carolina contiguous. The lands are situated west of Lumber River, which runs southward, and enters the sea at Georgetown. The town of Lumberton lies north of the tract. In Robeson County the holdings of the Michigan men are in the Big Swamp, or Great Swamp, as it is locally called, a portion of their property lying in Ashpole Swamp, over the line in South Carolina. Lumber River is a floatable stream, on which logs or lumber can be sent to Georgetown, and thus reach a point of shipment by sea. A railroad coming from the northwest crosses Lumber River and runs to Wilmington, N. C., another seaport. Thus there are two outlets to the sea, one by water and another by rail. Hence it can be seen that the astute Peters did not select this cypress property without reference to facilities for marketing lumber. The timber is described as growing tall and clean, many of the trunks being 80 feet long, without a branch. The trees also stand thickly on the ground. The swamp is not as wet as many on the lower Mississippi.

The owners have devised a great scheme for getting their cypress to mill and market. It is said that the land was acquired for the purpose of employing Butters' steam skidder. However that may be, this appliance for swinging logs from stump to rollway, car, or boat is to be the chief means for placing this North Carolina cypress where it will do the most good.

When the Michigan men had made their purchase, and began to talk about putting in a mill and manufacturing lumber, the natives proceeded to give their advice; which was mainly as to how not to do it. Those nice hospitable people down that way are great on conjuring up difficulties. When Peters and Butters proposed to cut a canal from Lumber River into the swamp by means of dredges, they were informed by the local oracles that it could not be done, for the reason that a dredge could not be got into the swamp. But the thing was done just the same, and now two of these huge steam shovels are spudding their way through the alluvium, amid cypress trees and stumps, at a mighty rate, and it is proposed to thus dig a channel six miles long to start with. A mill of 150,000 feet capacity will be erected at the point where the Wilmington Railroad crosses Lumber River, the logs to be floated to this mill by means of the canal. It is probable that the output will be railed to Wilmington for shipment to Baltimore, Philadelphia, New York, Boston, or whatever market may be most available.

By means of the steam skidder, placed on barges, logs can be gathered in for a distance of 600 feet each side of the canal. When the timber shall be exhausted along the main ditch, spur canals will be dredged out, and thus more cypress reached. This process will go on until the timber is all cut, and the entire swamp converted from noisome, malarious ooze into cultivable land of the richest kind. Now that the inhabitants are beholding what the Northerners are accomplishing, they are highly pleased, though the results will have gone back on their judgment and prognostications.

If Butters and Peters' enterprise shall prove a complete success, it will be an example of how to get out cypress timber. The great drawback to the cypress industry, when contemplated by Northern men, has been the difficulty of getting logs from the swamps. Such areas are covered with water a large portion of the year, and though overflows have hitherto been the means of floating cypress to the mills, the method is an uncertain one, and renders the mill operator wholly dependent on the caprice of the weather and the will of the darkies who venture into the swamps to cut timber. A Northern operator cannot brook such doubtful conditions. When he goes for logs, he wants to know that there is a reasonable prospect of getting them. Having invested his money in a mill plant, he wants to turn out a certain amount of lumber every year in order to keep business moving. The canal and steam skidder scheme seems to be the one that will solve the cypress problem. It will also be of vast benefit in draining the swamps of the South. Thus the two Michigan gentlemen who have initiated the North Carolina enterprise will be an instrument in the hand of Providence for lifting large areas of the opulent soil of the South out of the slimy waters that have covered them for ages. The process will bring health and wealth to extensive districts that have lain waste, breeding ground for reptiles, malaria, and death.—*Northwestern Lumberman.*


RIVER SEINE
QUAI DE LA CONFERENCE
AV. MONTAIGNE
AV. WAGRAM
AV. KLEBER
PLACE DU TROCADERO
PL. DE L'ALMA
PONT DE L'ALMA
PONT DE LA CONCORDE
PONT DE SOLFERINO
PONT DE LA TOUR MAUBOURG
PONT DE GRENELLE
PONT DE BIR-HAKEIM
PONT DE L'ALMA
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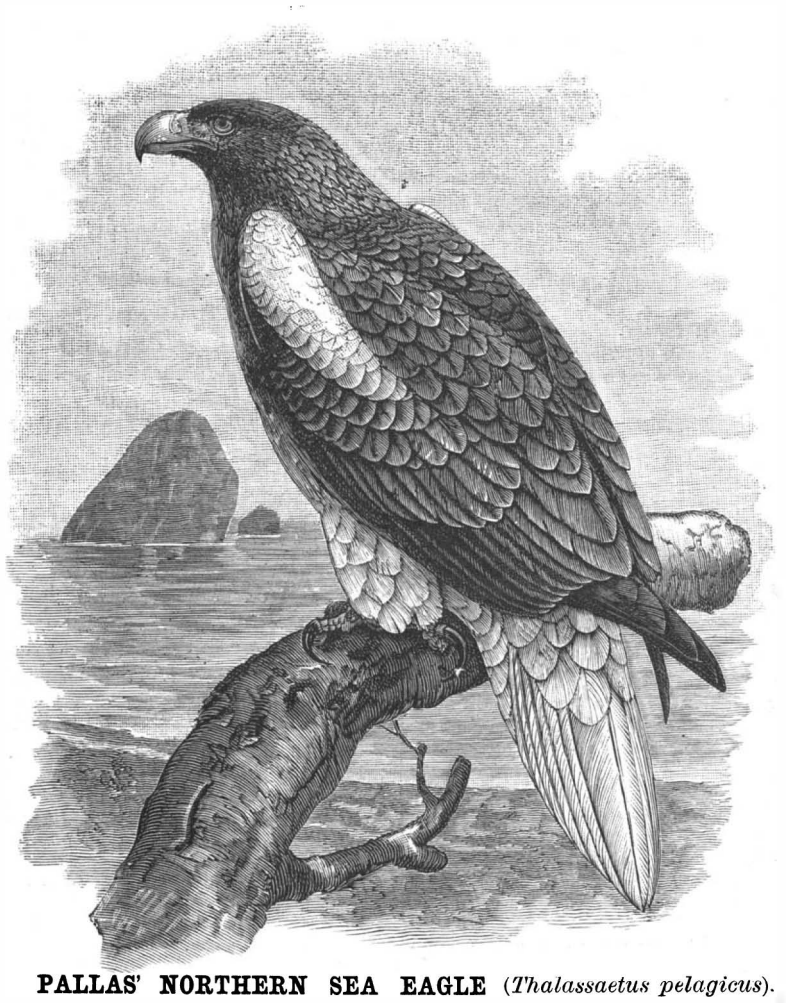
The Origin of Petroleum.

Professor Medelejef has advanced the theory that petroleum is of mineral origin, and that its production is going on and may continue almost indefinitely. He has succeeded in making it artificially by a similar process to that which he believes is going on in the earth; and experts find it impossible to distinguish between the natural and the manufactured article. His hypothesis is that water finds its way below the crust of the earth, and then meets with carbides of metals (particularly of iron) in a glowing state. The water is decomposed into its constituent gases. The oxygen unites with the iron, while the hydrogen takes up the carbon and ascends to a higher region, where part of it is condensed into mineral oil, and part remains as natural gas, to escape where it can find an outlet, or to remain stored at great pressure until a borehole is put down to provide it a passage to the surface. Oil-bearing strata occur in the vicinity of mountain ranges; and it is supposed that the upheaval of the hills has sufficiently dislocated the strata below to give the water access to depths from which it is ordinarily shut out.

PALLAS' NORTHERN SEA EAGLE.

(Thalassaetus pelagicus.)

This noble bird is found in Kamschatka, and during Dr. F. H. H. Guillemard's cruise in the Marchesa he made drawings of the same. Our engraving is from his book, and is therefore authentic. It is a magnificent bird, and is especially conspicuous from the large white shoulder patches and tail. It is very shy and difficult of approach.



PALLAS' NORTHERN SEA EAGLE (*Thalassaetus pelagicus*).

Natural History Notes.

A Steel Bird's Nest.—In the city of Soleure, Switzerland, there are quite a number of watch manufactories. According to *Isis*, Mr. Rueder, the owner of one of them, recently discovered on a tree in his garden a wagtail's nest constructed entirely of steel springs, and measuring nearly five inches in length. This nest, which was constructed with admirable skill, has been deposited in the cabinet of natural history of Soleure.

The Importance of Stomata in the circulation of the gases exchanged during respiration and the chlorophyl function is still disputed. The researches of Ungar, Sachs, Merget, and others have shown, it is true, that gases easily circulate through the stomata; but Mr. Boussingault, on the contrary, in his classical memoir on leaves, has established that the intensity of the chlorophyl phenomenon is independent of the stomata. We do not know, then, in what measure these orifices concur in causing the gases indispensable to respiration and to the chlorophyl function to enter the tissues. Mr. M. Mangin, in a note to the Academy of Sciences, presents the results of a certain number of experiments on this subject, and the following are his conclusions: The stomata are indispensable to the circulation of gases in aerial plants, and the closing of these orifices causes a more or less marked diminution in the respiratory gaseous exchanges, and a very great one in the chlorophyl gaseous exchanges.

The Locking of Birds' Wings.—In a paper read before the National Academy of Sciences, Prof. W. P. Trowbridge gave an account of a discovery that had lately been made by his son. This discovery is that birds of prey, and some others, have the power to lock securely together those parts of the wing holding the extended feathers, and corresponding to the human hand. The action of the air on the wing in this condition extends the elbow, which is prevented from opening too far by a cartilage, and the wings may keep this position for an indefinite length of time with no muscular action whatever on the part of the bird. While resting in this way, the bird cannot rise in a still atmosphere; but if there be a horizontal current it may allow itself to be carried along by it, with a slight tendency downward, and so gain a momentum by which, with a slight change of direction, it may rise to some extent, still without muscular action of the wings. Prof. Trowbridge also believed it possible for a bird to sleep on the wing.

Effect of Electric Light on Vegetation.—The electric lighting of the Winter Palace at St. Petersburg appears to have given rise to some unexpected and undesirable results. According to the *Electrician*, the sudden change from the sunless days of the northern winter to the blinding light of the banqueting halls, aided probably by the artificially heated and drier atmosphere of the rooms, causes the leaves of the plants used as ornaments to turn yellow, dry up, and fall off after being exposed to the light for a single night. The rapidity of the injurious action and its amount is in direct proportion to the intensity of the illumination, since plants partially shaded from the light, or in niches or similar places, were found to remain uninjured.

Preserving Plants for the Herbarium.—An excellent method of preserving the colors of flowers is given in the *Annals of Botany* by S. Schonland. It consists practically in a process of deoxidation by means of sulphurous acid. A saturated solution of sulphurous acid with water is mixed with methylated spirit in the proportion of three parts of the former to one of the latter. Plants with thick leaves are left for twelve or eighteen hours in this liquid, but delicate flowers only from five minutes to half an hour. After removal they are allowed to dry by exposure to the sun or to artificial heat and are then at once placed between sheets of drying paper in the usual way. If enough sheets are used, it is rarely necessary to change the paper. The above treatment not only preserves the color, but hastens the drying, so that sempervivums can be dried in two days and orchids and arums in one day. Plants which usually turn black in drying, such as *Melampyrum* and *Lathræa*, retain their natural color. In a few cases in which the color of the petals disappears, it returns when the plant is dry. The only difficulty attending the process is that of laying out delicate blossoms after treatment with the solution.

Habits of Ants.—On Thursday, December 1, Sir John Lubbock read a paper before the Linnean Society, in continuation of his previous memoirs, on "The Habits of Ants, Bees, and Wasps." He said it was generally stated that the English slave-making ant (*Formica sanguinea*), far from being entirely dependent on slaves, as was the case with *Polyergus rufescens*, the slave-making ant *par excellence*, was really able to live alone, and that the slaves were only, so to say, a luxury. Some of his observations appeared to throw doubt on this. In one of his nests the ants were prevented from making any fresh capture of slaves. Under these circumstances, the number of slaves gradually diminished, and at length the last died. At that time there were some fifty of the mistresses still remaining. These, however, rapidly died off, until at the end of June, 1886, there were only six remaining. He then placed near the door of the nest some pupæ of *Formica fusca*, the slave ant. These were at once carried in and soon came to maturity. The mortality among the mistresses at once ceased, and from that day to this only two more have died. This seems to show that the slaves perform some indispensable function in the nest, though what that is still remains to be discovered. As regards the longevity of ants, he said that the old queen ant, which had more than once been mentioned to the society, was still alive. She must now be fourteen years old, and still laid fertile eggs, to the important physiological bearing of which fact he called special attention. He discussed the observations and remarks of Graber as regards the senses of ants, with special reference to their sensibility toward the ultra-violet rays, and referred to the observations of Forel, which confirmed those he had previously laid before the society. Prof. Graber had also questioned some experiments with reference to smell. He, however, maintained the accuracy of his observations, and pointed out that Graber had overlooked some of the precautions which he had taken. His experiments seemed to leave no doubt as to the existence of a delicate sense of smell among ants. As regards the recognition of friends, he repeated some previous experiments with the same results. He took some pupæ from one of his nests (A) and placed these under charge of some ants from another nest (B) of the same species. After they had come to maturity, he placed some in nest A and some in nest B. Those placed in their own nest were received amicably, those in the nests of their nurses were attacked and driven out. This showed that the recognition is not by the means of a sign or password, for in that case they would have been recognized in nest B and not in nest A. Dr. Warsmann had confirmed his observations in opposition to the statement of Lespis, that white ants are enemies to those of another nest, even belonging to the same species. The domestic animals, on the other hand, can be transferred from one nest to another, and will be amicably received. In conclusion, he discussed the respective functions of the eyes and ocelli, and referred to several other observations on various interesting points in the economy of the social Hymenoptera.

Function of Raphides.—Dr. E. Stahl suggests that raphides, or needle-like crystals of oxalate of calcium, are not, as is usually taught, mere products of excretion in plants; but that they serve a useful function to the plant in protecting it from the attacks of herbivorous animals. He finds that snails will reject such parts of the plant as contain these crystals, and that they consume only those that do not. The poisonous properties attributed to *Arum maculatum*, and the burning taste of the leaves, are due solely to the enormous quantity of crystals of oxalate of calcium stored up in them.

Absorption of Water by Mosses.—Mr. J. Reynolds Vaizey, in a paper on the absorption of water by mosses, shows by a series of experiments made on *Polytrichum commune* and *P. formosum* that water can pass readily through the external cell walls of the leaf, although it will not do so through the surface of the fruit stalk. This he shows to be due to the fact that in the leaf there is no layer of cuticle present, and that the external walls of the cell have undergone some change, so that water is easily absorbed by them. The seta or fruit stalk, however, presents this structure at the base only; the surface of the seta, apophysis and sporangium is smooth and glistening, and not capable of absorbing water, in consequence of being strongly cuticularized, although water readily passes up the interior of the seta.

Fecundity of Fishes.—Fishes produce so many eggs that if vast numbers of the latter and of the fishes themselves were not continually destroyed, these animals would finally fill up all the waters. For example, man annually takes 60,000,000 or 70,000,000 codfish from the sea around the shores of Newfoundland. But even that quantity seems small when we consider that each cod yields about 45,000,000 eggs each season, and that even 8,000,000 have been found in the roe of a single cod. Were the 60,000,000 cod taken on the coast of Newfoundland left to breed, the 30,000,000 females producing 5,000,000 eggs every year, it would give a yearly addition of 150,000,000,000,000 young codfish. Other fish, though not equaling the cod, are wonderfully productive. A herring weighing six or seven ounces is provided with about 30,000 eggs. After making all reasonable allowances for the destruction of eggs and the young, it has been calculated that in three years a single pair of herrings would produce 154,000,000. Buffon calculated that if a pair of herrings could be left to breed and multiply undisturbed, for a period of twenty years, they would yield an amount of fish equal in bulk to the globe on which we live.

International Geological Congress.

The fourth session of this congress will be held in London from September 17 to 25 inclusive. Previous meetings were held in Paris in 1878, Bologna in 1881, and Berlin in 1885, at each of which a large number of geologists from all parts of the world were present. In Paris 21 countries were represented, in Bologna 17, and in Berlin 18. A circular has just been issued by the organizing committee of the London meeting, giving particulars of the congress and stating the general arrangements. A large and influential committee has been formed, including the chancellors of the chief universities, the presidents of the more important scientific societies and of those societies especially devoting themselves to geology, mining, etc., the Lord Mayor of London, and many of the chief government scientific officials. The honorary president of the congress is Professor Huxley, the president Professor Prestwich, and the vice-presidents are the president of the Geological Society, the Director-General of the Geological Survey, and Professor T. M'R. Hughes. Mr. F. W. Rudler is treasurer, Mr. T. W. Hulke and Mr. W. Topley are the general secretaries. To the last named all communications respecting the congress should be addressed at 28 Jermyn Street, London, S. W.

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ENGINEERING INVENTIONS.

A railroad switch has been patented by Mr. John J. Peetz, of Galveston, Texas. It is designed for operation by trip bars on a locomotive or car to open or close the switch, and without injury to the rails or actuating mechanism, or danger of derailing the cars, the invention covering various novel details and combinations of parts.

A car coupling has been patented by Mr. James F. Thornton, of Nicholas Court House, West Va. Combined with a drawhead having a link mortise and a vertical slide bar with a crosshead is a coupling pin, so arranged that the pin may be elevated for the insertion of the link by the contact of the crosshead with grapple hooks or bars, and cars may be coupled or uncoupled without the operator going between them.

AGRICULTURAL INVENTIONS.

A corn planter has been patented by Mr. Anderson Bussey, of Columbia County, Ark. Combined with a frame, plow, and covering shovel is a corn-dropping box rotating on a shaft held on the frame, the box having supplemental boxes communicating with openings in the sides of the dropping box, and being provided with slides to regulate the outflow of the dropping box.

A check row corn planter has been patented by Mr. August F. Tiede, of Deep Creek, Iowa. It is designed to drop hills of seed in accurate check row irrespective of the contour of the ground surface, while the seed-dropping mechanism may be set independently of the mechanism which drives it, to correct irregular dropping and to assure proper starting of the machine at the end of a field.

MISCELLANEOUS INVENTIONS.

An inkstand has been patented by Mr. Frederick Mitchell, of Brooklyn, N. Y. It is double, one inkstand serving as a cover for another beneath, the parts being detachable, so that they may be used singly.

A rafter gauge has been patented by Mr. John N. Cruson, of Elizabethtown, Ill. It has adjustable and sliding beveis, and is intended especially for aiding in determining the length and bevels of hip and jack rafters commonly used in hip roofs.

A weather strip has been patented by Mr. Franklin P. Burcaw, of Hazleton, Pa. This invention covers a novel construction and arrangement of parts and details, including flanged strips fitting into channels in moulding all around the door, whereby all bottom, side and top draughts are effectually precluded.

A sign has been patented by Mr. Andrew F. Foans, of New York City. The letters are each attached to a bent and counterweighted rod journaled in a board or other support, so that the motion or jar of a car, stage, or other conveyance will set the letters in motion to attract public attention.

A folding coop has been patented by Mr. William E. Tate, of Weatherford, Tex. The side, end, and top sections and partition are formed of wire or metal frames, with wire netting, making a coop which is strong and rigid in use, and which may be folded in a very compact form for transportation or storage.

A churn cover has been patented by Mr. Anderson B. Cosby, of Richmond, Va. The top edge of the churn body has a marginal metal ring, with upwardly projecting hook-shaped lugs cast upon it, its inner edge being slightly raised to form a bead upon which a wooden cover fits and makes a tight joint, the invention covering various other novel features.

A trotting harness has been patented by Mr. John H. Whitaker, of Davenport, Iowa. It has a shackle strap or collar inclosing the hind leg above the hock, with a yielding connection between the collar and the shaft, which will not impede the travel of the animal, but will act as a restraint causing him to travel with his hind legs wide apart.

A sash fastener has been patented by Mr. Jerome B. Kester, of Clarksburg, West Va. It consists of a gravitating latch pivoted to the sash and adapted to a notch or detent at the window frame, provided at its pendent part with a shoulder, a gravitating lock being pivoted to the window sash and adapted to overlie the latch shoulder, with other novel features.

A display box for neckties has been patented by Mr. John W. M. Uhrig, of New York City. It has side walls provided with longitudinally and inwardly extending wings, designed to support bow portions of the neckties for display, and permit a disposition of the tying strips beneath as a shield from view and also from dust.

A gate hinge has been patented by Mr. Oscar M. Hawley, of Church's Corners, Mich. It is an improvement in that class of hinges in which the gate may be slid back in the hinge, and the hinge turned upon its vertical axis, carrying the gate with it, the device being equally adapted to rail, picket, or wire gates.

A hospital transfer bed has been patented by Elizabeth D. Staples, of West New Brighton, and Hugh E. Ashcraft, of Goshen, N. Y. It consists essentially of an endless carrier belt or mattress, mounted on drums or rollers journaled in the bed frame, for easily transferring patients from one cot or bed to another.

A bridle bit has been patented by Mr. Oscar R. Gleason, of New York City. It has a mouth piece square in cross section, and side rings with downwardly projecting arms, these rings having upwardly projecting loops or eyes, the latter serving for use with a curb strap passing under the jaw for vicious or unruly horses.

A hay carrier has been patented by Messrs. Lindley and Ellwood Clark, of Cuba, Ohio. The invention covers a novel construction and arrangement of parts in an inexpensive device for carrying hay into hay mows and over the tops of hay stacks, and depositing it in any desired point within the range of the apparatus.

A trace detacher has been patented by Mr. John D. Blakeman, of Smith's Grove, Ky. The whiffletree has a projecting stud, on which loosely fits a collar with a guard arm and an inwardly projecting arm and loosely pivoted lever, which may be operated by the driver to detach the trace in case of accident or if the animal should run away.

A horse detacher has been patented by Mr. Noah Crim, of Galton, Ill. On each end of the whiffletree is a ferrule with spiral spring, socketed eye, and passage for trace-holding bolt spindle, from which flexible connections are guided to a common point, and by drawing upon which all the bolt spindles will be withdrawn at the same time and the traces released.

A grading and ditching machine has been patented by Mr. John C. Sage, of Atlanta, Ga. Combined with a main frame carrying plows is an adjustably connected conveyor to receive the earth from the plows, with power wheels and pulleys, and other novel features, the machine being adapted to be operated by hand power or a traction engine.

A hay press has been patented by Mr. George Ertel, of Quincy, Ill. The invention covers improvements on a former patented invention of the same inventor, whereby the cost of the press is reduced and its length and weight materially lessened, for increased facility in drawing over rough roads, and time and labor are saved in pressing the bales.

A mould for casting loose pulleys has been patented by Mr. John McCaffrey, of Lawrence, Mass. The invention consists in the combination of an internal disk core, an external ring core, with lugs on one of such parts, in a novel manner, whereby each pulley is formed in one piece, provided with a central oil chamber, radial ribs, and lateral openings for the admission of oil to the central opening.

A fastener or holder for paper or other materials has been patented by Mr. Cecil M. Durnil, of Fayette, Mo. It consists of a piece of spring wire bent to form a spring clamping arm, having an inner bent front holding-end portion and rear stiffening coil, the latter terminating beneath the clamping arm in a forwardly extending arm, to be attached to a board or other surface for clamping or holding articles.

A sweat pad fastener has been patented by Mr. Albert Hobt, of Wellston, Ohio. Combined with the collar and collar pad is a cotter-shaped fastening of malleable metal passed through the pad and through the hames crease of the collar, and folded down at its perforating ends within the crease, snugly fitting within the crease, and holding the collar and pad securely together.

A seat or back fastening for furniture has been patented by Mr. John M. Sander, of Bloomsburg, Pa. This invention relates especially to fastenings adapted to secure seats or backs of school furniture to the arms or irons connecting them to the seat arms or standards, dispensing with key or wedge fastenings, and covering novel features of construction and combinations of parts.

A head rest for coffins has been patented by Mr. John McGrath, of New York City. It consists of a base to which is attached a longitudinally curved plate adapted to the contour of the neck or head, a concave plate being transversely attached to the curved plate, with means for vertically adjusting the combined plates over the base, in connection with a detachable chin strap.

A spark arrester has been patented by Messrs. Frederick Bruhn and Jerome Raum, of Fort Shaw, Montana Ter. It consists of a series of spaced and graduated parallel screens and retaining standards, with outwardly projecting upper ends and knobs, to prevent sparks and cinders passing from the chimney stack, and throw them downward to the base of the chimney or stack.

A telephone receiver has been patented by Mr. Alonzo W. Brown, of Evanston, Wyoming Ter. A box is secured between the poles of a permanent magnet, and in the extremities of the magnet are threaded holes into which are screwed inwardly extending polar extensions, the usual diaphragm being replaced by a tongue arranged to vibrate between these extensions in unison with the vibrations of the current.

A safety appliance for elevators has been patented by Mr. Augusto Stigler, of Milan, Italy. It consists of wings pivoted at their outer sides beneath the floor of the cage, and having hook levers, in connection with levers pivoted beneath the end beams of the floor of the cage, with other novel features, whereby, when the elevator descends too rapidly, or the attendant loses control of it, the cage, will be automatically retarded or stopped.

NEW BOOKS AND PUBLICATIONS.

JOURNAL AND PROCEEDINGS OF THE ROYAL SOCIETY OF NEW SOUTH WALES FOR 1886. Sydney: Charles Potter. 1887. Pp. liii, 396.

Mineralogy, meteorology, language, anthropology, and similar subjects, form the matter of this volume, testifying to the wide range of the society's work. The book is well printed, and is a valuable record of the scientific life of the antipodes.

THE AMERICAN ANTHROPOLOGIST. Published under the auspices of the Anthropological Society of Washington. Vol. I., No. 1. January, 1888. Pp. 96.

In this very elegantly printed publication, various topics of anthropology are treated by different essayists. We welcome the appearance of the new journal, and wish it every success in its important field.

NEW APPROVED METHOD OF ZINC ETCHING OR PHOTO-ZINC ENGRAVING. By John Gast, 297 Adelphi Street, Brooklyn, N. Y. Price $1.

In a few pages this little work gives practical instructions how to make zinc relief plates. The method is said to be especially adapted for half tone reproductions or photo-nature engraving. It gives a concise and clear statement of the author's process.

A PRACTICAL MANUAL OF MINERALS, MINES, AND MINING. Comprising suggestions as to the localities and associations of all the useful minerals, full descriptions of the most effective methods for both the qualitative and quantitative analyses of these minerals, and hints upon the various operations of mining, including architecture and construction. By Professor H. S. Osborn, LL.D., author of the "Metallurgy of Iron and Steel." Illustrated by 171 engravings. 8vo. Pp. 367. Philadelphia: Henry Carey Baird & Co., 810 Walnut Street. Price $4.50. By mail, free of postage, to any address in the world.

We have here not only a very handsomely gotten up book, but a treatise which to us seems to fill a want in American technical literature. It covers a wide field, and covers it well. It not only contains a large amount of information in reference to the localities and associations of the useful minerals, especially in the United States, but is replete with very condensed information in practical mining, illustrated with great detail and elaboration. We know of no American book of its size, if of any size, which gives so many and such happy illustrations of the miner's practical work. It is calculated to prove a useful handbook to prospectors, analytical chemists, assayers, the owners of mineral lands, and miners. Like all of the publications of this house, it has a capital table of contents, which gives a compend of the matter which is in the book, and an exhaustive index, which together render every subject of importance in the volume easy of access.

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SCIENTIFIC AMERICAN BUILDING EDITION.

MARCH NUMBER.—(No. 29.)

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2. Plate in colors of a handsome suburban residence, costing about Twelve Thousand Five Hundred Dollars, with floor plans, specifications, sheet of details, etc.
3. Elevations and floor plans of two dwellings of moderate cost.
4. Perspective view and floor plans of a house for Six Thousand Dollars.
5. Floor plans and elevations of a substantial residence at Tuxedo Park.—James Brown Lord, architect.
6. Perspective and two plans of a Cape Cod cottage of moderate cost.
7. Plans and perspective of a double house, costing about Six Thousand Five Hundred Dollars.
8. Elevation and plans of an alteration of a dwelling on Long Island.
9. Sketch of a one story residence erected at Birmingham, Ala., at a cost of Four Thousand Five Hundred Dollars.
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The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

A Perfect Engine—Syracuse water motor, for driving light mach'y. Tuerk Water Meter Co., Syracuse, N. Y.

A reliable firm of good business ability, with capital, wants New York State agency for some good patented article. Murgenoride Bros., room 14, 229 Broadway, N. Y.

For best forges, blowers, exhausters, hand and power drills address Buffalo Forge Co., Buffalo, N. Y.

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Wanted—10" and 15" shapers universal miller, 30" gear cutter, 96" and 36" pulley borers, 60" pulley lathe, 400 lb. drop hammer. Address, giving maker's name, condition, and lowest price, Henry G. Adams, 94 Liberty St., New York.

For Sale—One-half interest in Leightham's steam boiler. See SCIENTIFIC AMERICAN, Feb. 18, 1888.

Burnham's turbine wheel is sold at net price to mill owners. Catalogue free. Address York, Pa.

The Dieble Manufg. Co., Philadelphia, Pa., manufacturers of the Challenge Emery Grinding and Polishing Machinery, invite correspondence with all needing this class of machinery. Catalogues and prices on application.

Wanted—A practical tool maker. An experienced mechanic, capable of managing that department in a hardware manufactory, may apply for situation to "Hardware," P. O. box 773, New York.

Patent button fastener, No. 376,497, for sale, or placed on royalty. Address A. L. Winn, Hillsboro, Ark.

The Diamond Prospecting Co., 22 W. Lake St., Chicago, Ill., general agents for the Sullivan diamond prospecting drills.

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The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Lathes for cutting irregular forms a specialty. See ad. p. 62.

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Catarrh Cured.

A clergyman, after years of suffering from that loathsome disease, catarrh, and vainly trying every known remedy, at last found a prescription which completely cured and saved him from death. Any sufferer from this dreadful disease sending a self-addressed stamped envelope to Prof. J. A. Lawrence, 212 East 9th St., New York, will receive the recipe free of charge.

Patent Rights for Sale. Apparatus for building Concrete Buildings and Walls. County rights, $50. State rights, $500. See descriptive notice in SCI. AMERICAN, May 22, 1886. Send for circulars. Ransome, 402 Montgomery St., San Francisco, Cal.

Hodges' universal angle union makes pipe connection at any angle. Rollstone Machine Co., Fitchburg, Mass.

Send for new and complete catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) G. C. asks: 1. Is there any way to find the length of belt by figuring? A. You can only compute the length of belts by knowing the distance of centers and adding to twice the distance the amount of lap for both pulleys. When both are alike, add 3·141 times the diameter of one pulley. If they are unlike, add to twice the distance of centers 1·57 of the diameter of each pulley. This will cost you more labor than to take the measure around the course of the belt with a tape line. 2. How to calculate speed of planer, revolutions of main shaft given, to find pulleys to make planer run any required number of feet per minute. A. For computing speeds of machines, multiply the diameter of the driving pulley in feet and decimals of a foot by its speed in revolutions per minute, and divide the product by the diameter of the driven pulley in feet and decimals of a foot, and so on to the last pulley or pinion, which will give the speed in feet per minute. 3. How to divide a given diameter and a given circumference into any number of equal parts in the lathe. A. By making a scratch on the edge of the large cone pulley and dividing the circle, with a pair of dividers, into the number of parts desired. 4. How to mark and chip key seat in pulley true with face, the hub not being faced off. A. Lay a straight edge across the rim of the pulley, and square the key seat from the straight edge. If the hub is higher than the rim, place two blocks of exactly equal thickness on opposite sides of rim, upon which the straight edge can rest.

(2) B. A. H. asks: 1. Is there any method of cutting and polishing petrified wood? A. Petrified wood and minerals can be cut and polished in the manner of lapidary work. See answers in back numbers notes and queries, No. 4, May 28, 1887; No. 22, September 3, 1887; No. 17, March 12, 1887. 2. Has the power obtained in a hydrostatic press been used to propel machines? A. Hydrostatic power is used in various ways through accumulators for saving time in running hydraulic presses. Such power may be also distributed to any number of hydraulic jacks, and is so used in India rubber works for raising large bedplates for pressing belting. 3. Can it be used in the place of jack screws for raising large buildings? A. Separate hydraulic jacks can be so used.

(3) G. S.—A solder made of equal parts of tin and lead melts at 368° Fah. You can burn the vapor of gasoline by saturating air with the vapor and passing it through a Bunsen burner. The arrangement for vaporizing should be similar to the air gas machines for lighting so much in vogue where there are no gas works. Unless you are familiar with gasoline and its explosive nature, when mixed with air, we do not recommend you to play with it. A good kerosene lamp will do all that you can accomplish with the gasoline. You will find samples of the kerosene stoves in the trade, which you can utilize or copy with a safer result.

(4) J. V. D. asks: How many cells of carbon battery, small size, will be required to light one Edison 6 candle power light? A. About 27 cells, arranged 9 in series and 3 in parallel.

(5) W. L. asks (1) how to remove the apparent greasiness on a wood blackboard. I have tried soap and hot water several times without any effect. A. Make a strong lye of pearl ashes and soft water, and add as much unslaked lime as it will take up. Stir it together and let it settle a few minutes, bottle it and stopper close. Have ready some water to dilute it when used, and scour the part with it. The liquor must not remain long on the board, as it will draw the color with it. Hence use it with care and expedition. 2. How can I remove old ink spots from the floor? A. By scouring with water and oxalic acid mixed. Then rinse with strong saleratus water.

(6) Old Reader asks: Please give formula for making photographer's paste. A. Mix thoroughly 630 grains of the finest Bermuda arrowroot with 375 grains of cold water in a capsule with a spoon or brush, then add 10½ ounces of water and 60 grains of gelatiné in fine shreds. Boil with stirring for 5 minutes, or until the liquid becomes quite clear, and when cold, stir in well 375 grains of alcohol and 5 or 6 drops of pure carbolic acid. Keep in well closed vessels, and, before using it, work up a portion with a brush in a dish.

(7) H. M.—The money made at the various mints goes into circulation on the order of the United States Treasurer, as called for by the different banks and financial institutions, in settlement of balances, the Treasurer filling orders for different coin according to the quantities being coined, and with regard also to date of application.

(8) J. D. M. asks: 1. Why did the moon during the late eclipse have a brown or smoky look rather than a black? A. We do not know that the moon ever looked black during its total eclipse. It is illuminated by diffused light. 2. Having reason to suspect sewer gas in a cellar, what will be simplest method of proving its presence? A. For the detection of sewer gas we know of nothing better than the sense of smell. There are valuable articles in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 67 and 418, on sewer gas.

(9) S. R. T. asks a composition of a cement which will join glass plates to brass, and which will not be soluble in bisulphide of carbon. A. Use silicate of soda.

(10) S. D. W. asks: 1. If gold was as cheaply obtained and as plentiful as brass, which, for its commercial and mechanical uses, would be of the greater value? A. The less oxidizable metal—gold. 2. We have a steam launch whose best speed is only four miles per hour in eddy water. If we desired to ascend a river, the current of which flows at the rate of five miles, could it be done with this launch? A. The boat would not ascend, but would descend at the rate of a mile an hour.

(11) J. H. K. asks: 1. What is the best method of filling and darkening ash and oak for antique finish? A. Spons' "Workshop Receipts," first series, which we can furnish for $2, gives very full information on the staining and finishing of woodwork. 2. Exclusive of burnishing, what is the best method and what materials should be employed for giving the highest possible to finish to brass? A. For brass work, the lathe, brush, and buff are the most effective means of giving a high polish. The materials are pulverized pumice, tripoli, and rouge. The last finish may be made with a cotton wheel and rouge wet with alcohol. Any dealer in jewelers' supplies in your city should give you the details with the materials. 3. What is the best lacquer for ornamental brasswork—one that will not alter the natural color of the metal? A. The best lacquer is pure shellac dissolved in 95 per cent alcohol. Let it stand in a close bottle for a few days, and decant the pure tincture. Use but ½ ounce shellac to 1 pint pure alcohol. When settled, it should look clear like wine. Thin, if required, by adding alcohol. Thin lacquer makes the best finish.

(12) W. W. asks the distance from the center span of the Forth bridge to the shore, in England. A. There are two central spans, of 1,700 feet each, with central pier on the Scotch island of Inchgarvie, in the middle of the Forth. There are 2,200 feet of viaduct and bridge from the South Queensferry shore in England to the main pier from which the 1,700 foot span springs.

(13) R.—For articles on curved ball in ball playing see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 410, 423, 410.

(14) W. W. has a petroleum engine, and wants to know how to burn off soot on the flues. A. It cannot be burned off. Open the rear end by taking off the plate, and scrape or brush off the soot. Catch it in a pan underneath.

(15) N. S. C.—Hard water is not always due to the same chemical element. You will find an interesting article on the Softening of Water in SCIENTIFIC AMERICAN SUPPLEMENT, 270, 187.

(16) H. W. W. writes: I have trouble in brazing my band resaws. I use brass and borax as a flux, but the heat required is so great that it burns out my irons and damages the saws. What I wish to learn is, is there a grade of brass that will melt at a temperature anywhere near that of silver and still have tenacity enough to answer for brazing the saws? A. The best material to braze with is the silver solder used by jewelers. Small coin will answer if you cannot get the other. If the saw is not too large, use a blowpipe and oil or alcohol lamp, the same as jewelers use, or a Bunsen burner. Bind the scarfed ends together with a small wire, and pin the saw upon a piece of charcoal or pumice stone, rubbed down flat on one side, with a depression under the place to be brazed to let the flame pass under freely; apply borax ground to a cream in water, place the solder at the edge of the scarf, and throw the blue point of the flame strongly upon the under side, so that the solder may draw through when it melts. This will make a clean joint, and heat no more than is necessary to accomplish the work.

(17) D. L. desires a cement for amber. A. Two surfaces of amber may be united by smearing them with boiled linseed oil, pressing them strongly together, and heating them over a clear charcoal fire. To keep the parts in firm contact, it may be well to tie them with soft iron wire.

(18) A. C. C. J. writes: I upset a jug of ink (the blackest copying ink, at that) on the end of a closed volume of Blackstone. Of course the ink ran quickly through the leaves and completely saturated it. It didn't, however, touch the printing, but has disfigured the book completely. How can I remove the ink? A. You might try dipping it in a warm solution of dilute oxalic acid and then washing the acid away quickly, but at best the job is a difficult one.

(19) Bath Tub writes: I want to paint a zinc bath tub white. Can it be painted so it will hold and be durable, and if so, how should the paint be prepared? I am informed there are no prepared paints for such purpose. A. Brush the zinc over with the following: 1 part copper nitrate, 1 part copper chloride, 1 part ammonium chloride, dissolved in 64 parts of water to which 1 part of commercial hydrochloric acid is added. When the zinc dries, in the course of 12 to 24 hours, a coat of any oil color will adhere firmly to the dirty gray surface of the zinc.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

February 21, 1888,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Acid distributing apparatus, sulphuric, F. W. Chappell ... 378,289
Aerial navigation, W. Gustafson ... 378,364
Agricultural implement, L. Whitty ... 378,347
Air brake, I. Harvey, Sr ... 378,365
Air compressors, valve mechanism for, E. Reynolds ... 378,336
Alarm. See Fire and burglar alarm. Time, temperature, and burglar alarm.
Aluminum, producing, Howard & Hill ... 378,136
Amalgamator, J. Wilkins ... 378,348
Anchor and oiler, floating, M. McCarthy ... 378,171
Aquascope, P. Wright ... 378,126
Atomizer, A. De Vilbiss ... 378,357
Auger bits, die for making, C. H. Irwin ... 378,251
Auger bits, die for making, Thomas & Irwin ... 378,408
Bag or satchel frame, W. Roemer ... 378,263
Bar. See Grate bar.
Bars, machine for cutting scrolls on ends of, J. Koen ... 378,168
Bark, treating cinchona, P. Casamajor ... 378,231
Bark, treatment of cinchona, P. Casamajor ... 378,233
Battery. See Galvanic battery.
Beading cutter, J. H. Anthony ... 378,159
Bearing, anti-friction, M. R. Wood ... 378,350
Bed bottom, R. W. Homan ... 378,397
Bed, hospital transfer, Staples & Asncraft ... 378,220
Bell, door, A. Iske ... 378,317
Bell, electro-magnetic, J. & S. Wetzler ... 378,124
Belt, driving, F. B. Brock ... 378,229
Belts, fabric for driving, G. Schneider ... 378,151
Binder, N. Hawkins (r) ... 10,903
Bit. See Bridle bit.
Bit brace, A. D. White ... 378,274
Block. See Brake block.
Boiler covering, C. B. Manville ... 378,372
Bottle attachment, G. P. Whittlesey ... 378,276
Bottle stopper, faucet, L. S. Hoyt ... 378,366
Bottle stoppers, machine for making wire fasteners for, Reed & Wheeler ... 378,177
Bottle top, I. Pomeroy ... 378,108
Box. See Music box.
Box stapling machine, C. L. Lasch ... 378,324
Brace. See Bit brace.
Brake. See Air brake.
Brake block, G. A. Posson ... 378,215
Brick drier, W. E. Cole ... 378,236, 378,237
Bridle bit, O. R. Gleason ... 378,305
Brush bodies, machine for boring, J. V. Gane ... 378,131
Brush making machine, J. V. Gane ... 378,132
Brushes, etc., apparatus for inserting and fixing the bristles of, J. V. Gane ... 378,130
Bustle, M. B. Hammond ... 378,134
Bustle, S. S. Williamson ... 378,187
Button and fastener, A. Storck ... 378,182
Buttonhole stitching and barring machine, J. H. Reed ... 378,217, 378,404
Buttonholes, barring, J. H. Reed ... 378,218
Cam, dwell, J. Thomson ... 378,343
Can opener, W. B. & G. H. Williamson ... 378,349
Cant hook, L. L. Cook ... 378,386
Car coupling, H. L. Arnold ... 378,228
Car coupling, Cowher & Numer ... 378,163
Car coupling, W. H. Dawson ... 378,194
Car coupling, I. Hazelton ... 378,311
Car coupling, C. R. King *et al.* ... 378,370
Car coupling, D. Schofield ... 378,265
Car coupling, J. F. Thornton ... 378,409
Car coupling, Thurston & Butterfield ... 378,269
Car, dumping, Hughes & Williams ... 378,368
Car heaters, brakes, etc., coupling and cut-off for steam and air pipes for, J. Briscoe ... 378,284
Car spring, C. T. Schoen ... 378,264
Cars, track cleaning attachment for street, Peper & Sobinski ... 378,374
Card exhibitor, W. D. Valentine ... 378,345
Card exhibitor, Valentine & Bailey ... 378,270
Carpet in rolls, device for securing the ends of, Clark & Loree ... 378,290
Carriage wheel, S. D. Forbes ... 378,302
Carrier. See Hay carrier.
Cart, road, Z. T. Bush ... 378,354
Cartridge for firearms, J. P. Lee ... 378,255
Cartridge implement, H. A. Lyon ... 378,400
Chain, drive, B. A. Legg (r) ... 10,904
Chain, drive, B. Oborn ... 378,173
Chain for conveyers, B. A. Legg ... 378,139
Chain making machine, J. Kinder ... 378,252
Churn, S. D. Palmer ... 378,144
Cigar holder, J. H. Noble ... 378,104
Clasp, D. F. Dalton ... 378,288
Closet. See Water closet.
Clutch, T. M. Foote ... 378,088
Coaster, carrier, and ferrier, cable, J. Van Zandt ... 378,154
Coat hook, W. H. Jacoby ... 378,201
Coffee pot, L. Ehrlich ... 378,296
Coffin, E. Bangs ... 378,076
Coffins, head rest for, J. McGrath ... 378,207
Comb. See Weaver's comb.
Cotton gin, A. G. Jennings ... 378,167
Coupling. See Car coupling. Pipe coupling. Pipe well coupling. Thill coupling.
Coupling and brake, combined, A. Hodgson ... 378,315
Cradle, Duffy & Reling ... 378,389
Crate, berry or fruit, S. R. Krafner ... 378,098
Cuff holder, E. R. Horton ... 378,094
Cultivator, Glidden & Vaughan ... 378,089
Cultivator, E. P. Lynch ... 378,141
Cultivator, Schermerhorn & Jury ... 378,377
Current transformer, alternating, R. Kennedy ... 378,320
Curtain pole, adjustable or extension, A. D. Field ... 378,087
Curtain pole covering, A. D. Field ... 378,085
Curtain pole, upholstered, A. D. Field ... 378,086
Cutter. See Beading cutter. Feed cutter.
Decoy duck, W. D. Trimble ... 378,410
Dental engine, W. B. Mann ... 378,204
Dish washer, Stevens & Caunter ... 378,152
Display frame, L. Strauss ... 378,407
Door, L. S. Enos ... 378,359
Door mat, S. L. Cohen ... 378,356
Doubling and splitting machine, chained yarn, S. M. Johnson ... 378,398
Drier. See Brick drier.
Egg preserver, Ford & Delbridge ... 378,303
Electric lights, manufacture of incandescent, T. Mace ... 378,258
Electric machines, core for dynamo, W. C. Rechniewski ... 378,375
Electric energy, transformation and distribution of, R. Kennedy ... 378,321
Emulsifier, G. W. Towar, Jr ... 378,381
End gate, P. Bartzen ... 378,352
Engine. See Dental engine. Power engine.
Engine dash pot, steam, F. Phillips ... 378,105
Excavating bucket, T. & J. J. Lawler ... 378,099
Excavator, J. S. Whitcomb ... 378,125
Feed cutter, E. W. Rider ... 378,112
Fence, O. D. Hearn ... 378,312
Fence machine, T. J. Smith ... 378,378
Fender. See Horse rake fender.
Fifth wheel, vehicle, P. Doersom ... 378,240
Filtering beer, H. Stockheim ... 378,379
Fire alarm systems, conductor for electrical, W. A. Barnes ... 378,078
Firearm, breech-loading, M. Bye ... 378,355
Firearm sight, J. Manton ... 378,205
Fire and burglar alarm, R. J. La Rue ... 378,323
Fire escape, T. P. Holt ... 378,316
Fire extinguisher, W. G. Browne ... 378,285
Folding mosquito net, tarlatan, and other piece goods, I. E. Palmer ... 378,212
Forges, driving mechanism for, E. E. Webb ... 378,273
Frame. See Bag and satchel frame. Display frame.
Fuel composition, E. Henn ... 378,249
Furnace. See Hot air furnace. Smoke consuming furnace.
Furniture, seat or back fastening for, J. M. Sauder ... 378,219
Gauge. See Rafter gauge.
Galvanic battery, H. Walter ... 378,121
Galvanic battery, Walter & Marsh ... 378,122
Gangway, stock, H. T. Keenan ... 378,319
Garment stay, E. C. Bowling ... 378,080
Garment supporter, C. A. Preston ... 378,147, 378,148
Gas, apparatus for the manfacture of, A. C. Humphreys ... 378,095
Gas mains, means for detecting leakage from, S. R. Brick ... 378,283
Gas or vapor, device for generating and burning, M. Zeck ... 378,411
Gases, apparatus for mingling and combining, A. C. Lewis ... 378,326
Gate. See End gate.
Gate, W. R. White ... 378,275
Gate spring, T. Clough ... 378,191
Glass holder, C. W. Fox ... 378,361
Goods, stand for displaying, R. H. Maxson ... 378,206
Governor, steam engine, J. S. Marshall ... 378,170
Grading and ditching machine, J. C. Sage ... 378,406
Grain binder, McCormick, Jr., & Pridmore ... 378,401
Grain brinder, C. B. Withington ... 378,225 to 378,227
Grate bar, I. N. Dickinson ... 378,195
Grater, E. Baltzley ... 378,127
Gun carriage, A. Noble ... 378,333
Gun carriages, recoil cushion for, E. Hill ... 378,314
Guns, extractor mechanism for breech-loading, W. Lorenz ... 378,169
Hame fastener, E. F. Butler ... 378,128
Harrow, J. M. Childs ... 378,081
Harvester, clover, Thomasson & Pence ... 378,184
Hay carrier, L. & E. Clark ... 378,190
Hay press, G. Ertel ... 378,197
Hay unloader and stacker, O. Hoyt ... 378,200
Heating retorts and muffles, apparatus for, A. Kloone ... 376,097
Heel forming and attaching machine, F. F. Raymond, 2d ... 378,216
Hinge, gate, O. M. Hawley ... 378,199
Holder. See Cigar holder. Cuff holder. Glass holder. Pen holder. Pillow sham holder. Tag holder.
Hook. See Cant hook. Coat hook.
Hoop for trundling, J. F. Lipphard ... 378,327
Horse detacher, N. Crim ... 378,193
Horse rake fender, L. Mundy ... 378,103
Horses, throat protector for, W. O. Mills ... 378,373
Horseshoe machine, Z. V. Purdy ... 378,111
Hose nozzle, A. Hallowell ... 378,308
Hot air furnace, W. Miller ... 378,101
Indicator. See Oil tank indicator.
Injector, C. E. Randall ... 378,403
Injector, steam, L. M. Berry ... 378,281
Inkstand, F. Mitchell ... 378,208
Instrument, combination, F. McIntyre ... 378,261
Iron. See Tailor's charcoal iron.
Jack. See Lasting jack.
Jack spool, L. N. Parks ... 378,174
Key. See Pulley key. Telegraph key.
Knife handles, machine for making hollow metallic, Chadwick & Boutwell ... 378,287
Lamp fixture, incandescent electric, H. M. Doubleday ... 378,358
Lasting jack, S. D. Tripp ... 378,118
Lathe for turning irregular forms, P. Kettenring ... 378,322
Leather splitting machine, W. E. Adams ... 378,157, 378,158
Leather splitting machine, S. Ross, Jr ... 378,170
Leather splitting machine, G. L. Tyler ... 378,185, 378,186
Letter box, alarm, G. F. Girvan ... 378,166
Lever power engine, E. T. Wheet ... 378,155
Liquids in vacuum pans, treating, P. Casamajor ... 378,230
Lock, W. H. Taylor ... 378,267, 378,268
Locomotive exhaust apparatus, J. Y. Smith ... 378,340
Lubricating composition, D. L. McKitrick ... 378,331
Mail matter, machine for marking, M. V. B. Ethridge ... 378,391
Mailing machine, J. G. Hardie, Jr ... 378,309
Mat. See Door mat. Rubber mat. Wire mat.
Metallic bodies, die for forming hollow ornamental, J. Burkhardt ... 378,413
Metals with aluminum, combining, W. A. Baldwin ... 378,278
Motion, device for converting, J. H. Pemberton ... 378,334
Motor. See Petroleum motor. Rotary motor.

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Movement, device for imparting combined rotary and reciprocating, J. Thomson 378,344
Mower, L. Erpelding 378,390
Music box, A. L'Epee 378,399
Neckties, display box for, J. W. M. Uhrig 378,224
Oil, refining cotton seed, G. W. Scollay 378,113, 378,114
Oil tank indicator, F. S. Mason 378,330
Oils, refining Canadian and similar petroleum, H. Frasch 378,246
Ordnance, operating, A. Noble 378,172
Ordnance, etc., trunion bearing for, R. T. Brankston 378,282
Ore feeder, E. C. Loftus 378,371
Overshoe, rubber, E. Forbes 378,245
Pad. See Shoulder pad.
Paper drying machine, A. A. Simonds 378,266
Peanut roaster, T. Lee 378,256
Peat, treating, S. Heimann 378,395
Pen holder, L. L. Tower 378,223
Pencil, J. F. Dodd 378,084
Pencil sharpener, lead, T. H. Stafford 378,117
Pencil sharpener, slate, T. J. Manning 378,329
Petroleum motor, List & Kosakoff 378,328
Pillow sham holder, Hemmenway & Stratton 378,396
Pin. See Safety pin.
Pipe connection, roof cast iron soil, J. T. Fitzpatrick 378,360
Pipe coupling, A. H. Rowand 378,150
Pipe well coupling, M. T. Chapman 378,234
Planers, friction feed mechanism for iron, F. Phillips 378,106
Planter, check row, A. F. Tiede 378,222
Planter, corn, J. C. Barlow 378,279
Planter, corn, A. Bussey 378,189
Planter, corn, J. De Butts 378,164
Planter, cotton seed, B. B. Pritchett 378,109
Planter, cultivator, and cotton chopper, combined, corn and cotton, J. W. Carley 378,286
Planter, seed, A. Barker 378,077
Pot. See Coffee pot. Engine dash pot.
Power mechanism, G. Cottrell 378,192
Press. See Hay press.
Pressure regulator and cut-off, W. D. Thomas 378,542
Pressure regulator, fluid, W. S. Clarkson 378,291
Printing machines, gripper for platen, H. F. Bechman 378,160
Printing presses, inking apparatus for, G. W. Prouty 378,110
Propeller wheel, W. L. Strong 378,221
Protector. See Stamp protector.
Pulley key, P. McDermott 378,260
Pump, E. Neff 378,402
Pump, force, A. D. Shelnutt 378,338
Punch, metal, W. Snee 378,341
Radiator, J. Hopson, Jr 378,093
Rafter gauge, J. N. Cruson 378,387
Rails, apparatus for toughening steel, J. Coffin 378,083
Railway, electric, C. T. Mason 378,259
Railway switch, J. J. Peetz 378,213
Railway tie, J. M. Giberson 378,133
Railway tie and fastening therefor, metallic, F. L. Barrows 378,280
Railways, automatic block signal system for, F. S. Guerber 378,306
Railways, track scraper for street, G. W. Davis 378,292
Refrigerator, G. M. Lee 378,254
Regulator. See Pressure regulator. Temperature regulator.
Revolver, A. Greth 378,091
Roaster. See Peanut roaster.
Rolling flangeless center bearing rails, roll for, A. J. Moxham 378,211
Rolling girder rails, roll for. A. J. Moxham 378,209, 378,210
Rotary motor operated by fluid pressure, V. Popp 378,146
Rubber goods, machine for making figured gossamer, D. Harkins 378,247
Rubber mat for store cases and counters, C. S. Hyer 378,369
Rubber soles, method of and apparatus for cutting, Snyder & Roht 378,405
Ruler and section liner, parallel, W. C. Meyer 378,142
Saccharine solutions, treating, P. Casamajor 378,232
Safety pin, J. Jenkins 378,318
Sand sifting machine, J. J. Carr 378,129
Sash fastener and holder, combined, J. D. Axtell 378,351
Saw, L. Lohman 378,208
Saw sharpening device, G. W. Amesbury 378,277
Scaffold, builder's, E. S. Moss 378,102
Scale, automatic grain, J. Gudinger 378,363
Scale, weighing, A. Turnbull 378,382
Screen. See Window screen. Wire screen.
Screens, grates, and panels, construction of, J. Burkhardt 378,415
Seaming machine, double, Norton & Hodgson 378,143
Secondary batteries, system of electrical distribution by, J. S. Sellon 378,115
Sewing machine, E. E. Angell 378,075
Sewing machine embroidering attachment, J. W. Von Pittler 378,383, 378,384
Sewing machine looper, R. Fryer 378,165
Shade fixture, window, R. J. Betts 378,079
Shoes, polishing compound for the soles of, C. L. Leonard 378,325
Shoulder pad, W. B. Haskins 378,394
Shutter bower, A. A. Wheelock 378,346
Shutter worker, L. A. & O. L. Dosch 378,388
Sign, A. F. Foans 378,198
Smoke consuming furnace, J. Keane 378,096
Snow scraper, J. W. Haines 378,307
Spark arrester, Bruhn & Raum 378,188
Spark arrester, J. Haish 378,092
Spheroidal and analogous bodies, mechanism for forming ornamental, J. Burkhardt 378,417
Spheroidal bodies from sheet metal tubes, forming hollow, J. Burkhardt 378,412
Spinning machine, M. Chapon 378,288
Spring. See Car spring. Gate spring. Vehicle spring.
Stamp protector, W. P. Trowbridge 378,119
Stitching horse, H. Doering 378,295
Stone dressing tool, M. P. Higgins 378,313
Stopper. See Bottle stopper.
Stove, G. R. Prowse 378,149
Stove, cooking, A. Anderson 378,074
Stove cover, adjustable, S. Waterman 378,271
Stove or furnace, G. D. Blossom 378,161
Stoves, oven for vapor, H. Flynt 378,301
Studs or pillars, forming ornamental, J. Burkhardt 378,414
Supporter. See Garment supporter.
Surgical bandages, making, W. B. & E. Robinson 378,178
Suspensory, B. Galland 378,304
Sweat pad fastener, E. Q. Darr 378,239
Switch. See Railway switch. Telephone switch.
Table attachment, card, Drude & St. Arnauld, 378,241, 378,242
Tag holder and hasp lock, combined, R. W. Greene 378,393
Tailor's charcoal iron, F. W. Eisenberg 378,297
Tap, collapsing, J. T. Hayden 378,310
Tap, collapsing, B. B. Switzer 378,380
Tapping mains, device for, C. H. Simmons 378,116
Telegraph cable, W. R. Patterson 378,175
Telegraph key and instrument, W. A. Melbourne 378,332
Telegraph, printing, D. E. Pike 378,107
Telegraphy, multiple, C. Selden 378,181
Telephone, mechanical, Stubblefield & Holcomb 378,183
Telephone receiver, A. W. Brown 378,385
Telephone switch, J. R. H. Hinton 378,250
Telephonic transmitter, M. G. Farmer 378,298
Temperature regulator, automatic, J. T. Hawkins 378,248
Temperature regulator, automatic, W. S. Johnson 378,137
Thill coupling, J. W. Pendleton 378,262
Tie. See Railway tie.
Time, temperature, and burglar alarm and call bell, electric, H. P. F. Jensen *et al* 378,202
Tonic, alterative, W. Whitney 378,156
Trigonometrical computations, instrument for, A. J. Leschorn 378,257
Truck, stove, G. Hess 378,135
Uncoupler, automotic, W. R. Funk 378,392
Valve plugs, seats, etc., machine for truing, D. F. Dunn 378,196
Valve, throttle, C. Lozon 378,140
Vapor burner, generating, J. B. Wallace 378,120
Vehicle spring, J. England 378,244
Vehicle spring, A. C. Fish 378,300
Vehicle, spring, H. W. Pell 378,145
Vehicle, spring, A. Schubert 378,180
Vehicle, two-wheeled, D. S. Pembroke 378,335
Velocipede, E. G. Latta 378,253
Veterinary purposes, harness for, L. C. Tiffany 378,153
Vise, B. R. Clark 378,082
Vise, foot power bench, J. Goodrich 378,362
Wagon bed and brake, combined, S. R. Riffle 378,337
Wagon brake lever, W. A. Westbrook 378,123
Wagon, dumping, D. S. Watson 378,272
Washer. See Dish washer.
Washing machine, W. C. Edwards 378,243
Washing machine, J. F. Kuhlman 378,138
Watches, display stand for non-magnetic, A. C. Smith 378,339
Water closet cistern, J. Demarest 378,294
Water closet flushing apparatus, S. G. McFarland 378,100
Water closet, pump, W. Bishop 378,353
Water closets, device for closing the lids of, A. Chainay 378,162
Water closets, reservoir or tank apparatus for, G. W. Hubbard 378,367
Weaver's comb, P. Rooney 378,376
Weights, device for raising and lowering, M. V. Davis 378,293
Wheel. See Carriage wheel. Fifth wheel. Propeller wheel.
Windmill, T. J. Alexander 378,073
Windmill, M. T. & M. C. Chapman 378,235
Window screen, H. H. Greenman 378,090
Wire joining machine, Pond & Provan 378,176
Wire mat, W. R. Pitt 378,214
Wire screen, etc., J. Burkhardt 378,416
Wrench, J. L. Finch 378,299

TRADE MARKS.

Alloys and articles made therefrom, Phosphor Bronze Smelting Company 15,226
Alloys and articles made therefrom, metallic, Phosphor Bronze Smelting Company 15,225
Ball goods and outfits, base, R. F. Fenno 15,196
Beverage, non-alcoholic, C. H. Sagar 15,215
Biscuits, crackers, wafers, and similar articles, Holmes & Coutts 15,203, 15,204
Boots and shoes, T. Miles' Sons 15,210
Candy, Hawley & Hoops 15,201
Corn, ensilage, D. H. Burrell & Co 15,194
Draughtsmen and engineers, certain supplies and instruments for, E. G. Soltmann 15,220
Earthenware and glazed tiles, printed, white, granite, general, T. & R. Boote 15,191
Embroideries, Hamburg, L. Levy & Bros 15,206
Emollient, W. W. Scott 15,217
Fertilizers, ground bone, H. S. Miller & Co 15,209
Flour, S. W. Weidler 15,224
Garters, G. Frost & Co 15,198
Gum, chewing, Adams & Sons 15,189
Hair cleanser, Smith Brothers 15,219
Hosiery, E. B. Sudbury 15,221
Hosiery and gloves, E. B. Sudbury 15,222
Laundry blue, R. F. S. Heath 15,202
Mainsprings for timepieces, L. Hammel & Co 15,200
Medicine, blood purifying, Moore Manufacturing Company 15,212
Oil, kerosene, W. Briscoe & Son 15,192
Perfumery, Ladd & Coffin 15,205
Photographic use, albumenized paper for, Buchanan, Bromley & Co 15,193
Plows, furrow, Universal Plow Company 15,223
Ruchings, ladies', E. Slayton 15,218
Safe, Alpine Safe Co 15,190
Salve, L. A. Canterbury 15,195
Shirts, coats, jackets, and overalls, Gallt & Branch 15,199
Tableware constructed of silver or of other metals and then plated or tinned, G. I. Mix & Co 15,211
Tin and terne plates, Merchant & Co 15,207
Tin plates, Merchant & Co 15,208
Tonic beverage, Phillip Best Brewing Company 15,213
Toy musical instrument, A. Schoenhut & Co 15,216
Valves, rubber, Revere Rubber Company 15,214
Wines, whiskies, brandies, and other distilled spirits, Fischer & Heinrichs 15,197

DESIGNS.

Bottle stopper, S. S. Newton 18,105
Broom ferrule, A. Walrath 18,110
Buckle, G. F. Eberhard 18,066, 18,067
Calendar, F. Brackett 18,065
Carpet, J. L. Folsom ..... 18,068 to 18,097
Carpet, T. E. Meagher ..... 18,102 to 18,104
Carpet, O. Righter ..... 18,106 to 18,109
Dynamos, frame for, D. J. Hauss 18,099
Lamp, incandescent, D. J. Hauss 18,098
Paper weight, D. Ball 18,064
Skirts, ornamentation of, A. Hildt 18,100
Stove, cooking, Keep & Wipfler 18,101

A Printed copy of the specification and drawing of any patent in the foregoing list will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian Patents may now be obtained by the inventors for a y of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated, the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

FORTY-THIRD ANNUAL REPORT
OF THE
NEW YORK LIFE INSURANCE COMPANY

Office: Nos. 346 & 348 Broadway, New York.

JANUARY 1, 1888.

Amount of Net Assets, January 1, 1887 ..... $71,819,623.48

REVENUE ACCOUNT.

Premiums	$19,328,519.87	
Less deferred premiums, January 1, 1887	1,041,666.15—	$18,286,853.72
Interest and rents, etc	4,253,430.50	
Less Interest accrued January 1, 1887	486,497.10—	3,765,933.40—$22,052,787.12
		$93,872,410.60

DISBURSEMENT ACCOUNT.

Losses by death, and Endowments matured and discounted (including reversionary additions to same)		$4,36[illegible],366.88
Dividends (including mortuary dividends), annuities, and purchased insurances		5,173,843.96
Total Paid Policy-holders	$9,535,210.79	
Taxes and re-insurances		264,495.60
Commissions (including advanced and commuted commissions), brokerages, agency expenses, physicians' fees, etc		3,531,026.06
Office and law expenses, salaries, advertising, printing, etc		629,360.98—$13,960,093.48
		$79,912,317.17

ASSETS.

Cash on deposit, on hand, and in transit		$3,088,499.60
United States Bonds and other bonds and stocks (market value, $52,255,814.82)		49,088,286.14
Real Estate		6,887,092.59
Bonds and Mortgages, first lien on real estate (buildings thereon insured for $14,000,000 and the policies assigned to the Company as additional collateral security)		15,969,372.78
Temporary Loans (market value of securities held as collateral, $2,404,853)		1,867,500.00
*Loans on existing policies (the Reserve on these policies, included in Liabilities, amounts over $2,000,000)		388,799.44
*Quarterly and semi-annual premiums on existing policies, due subsequent to Jan. 1, 1888,		1,174,340.36
*Premiums on existing policies in course of transmission and collection. (The Reserve on these policies, included in Liabilities, is estimated at $1,300,000)		839,156.08
Agents' balances		170,792.59
Accrued Interest on investments, January 1, 1888		488,477.59—$79,912,317.17
Market value of securities over cost value on Company's books		3,167,528.68

*A detailed schedule of these items will accompany the usual annual report filed with the Insurance Department of the State of New York.

TOTAL ASSETS, JANUARY 1, 1888, - - - - - - $83,079,845.85

Appropriated as follows:

Approved losses in course of payment		$327,078.38
Reported losses awaiting proof, etc		262,214.54
Matured endowments, due and unpaid (claims not presented)		27,582.30
Annuities due and unpaid (claims not presented)		13,042.96
Reserved for re-insurance on existing policies; participating insurance at 4 per cent Carlisle net premium; non-participating at 5 per cent Carlisle net premium	$68,807,642.00	
Additional amount of Reserve (transferred from Surplus account) required on account of new State Standard of valuation (Actuaries, 4 per cent), taking effect December 31, 1887	1,592,098.00—	70,399,740.00
Reserved for contingent liabilities to Tontine Dividend Fund, January 1, 1887, over and above a 4 per cent Reserve on existing policies of that class	4,176,425.25	
Addition to the Fund during 1887	1,785,602.54	
DEDUCT—	$5,962,027.79	
Returned to Tontine policy-holders during the year on matured Tontines	646,306.96	
Balance of Tontine Fund January 1, 1888		5,315,720.83
Reserved for premiums paid in advance		52,886.73
		$76,428,265.74
Divisible Surplus (Company's New Standard)		6,651,580.11
		$83,079,845.85

Surplus by the present New York State Standard, i. e. 4 per cent. Actuaries', including the Tontine Fund) $11,846,793.06

From the undivided surplus, as above, the Board of Trustees has declared a Reversionary dividend to participating policies in proportion to their contribution to surplus, available on settlement of next annual premium.

Number of Policies issued during the year, 28,522. Risks assumed, $106,749,295.

Total number of policies in force Dec. 31, 1887, 113,323. Amount at Risk, $358,935,536.

TRUSTEES:

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WILLIAM A. BOOTH,	ROBERT B. COLLINS,	EDWARD MARTIN,	JOHN N. STEARNS,	A. H. WELCH,
HON. BENJ. H. BRISTOW,	ALEX. STUDWELL,	RICHARD MUSER,	WM. L. STRONG,	L. L. WHITE.

THEODORE M. BANTA, Cashier.
A. HUNTINGTON, M.D., Medical Director.

WILLIAM H. BEERS, President.
HENRY TUCK, Vice-President.
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RUFUS W. WEEKS, Actuary.

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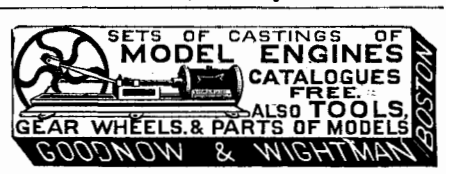

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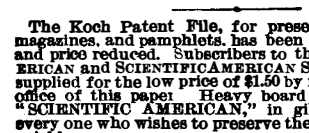

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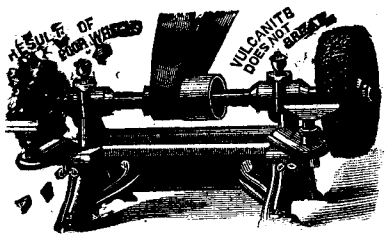

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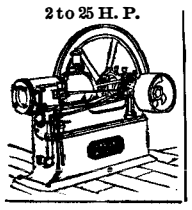

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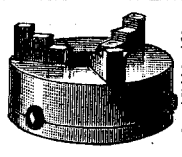

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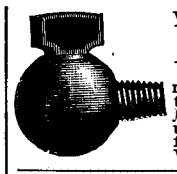

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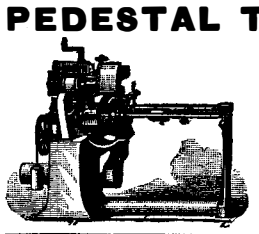

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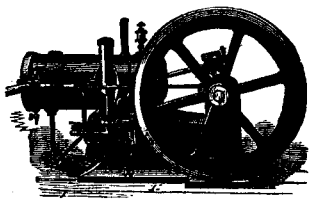

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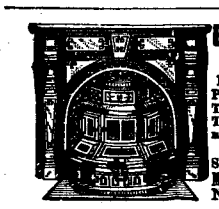

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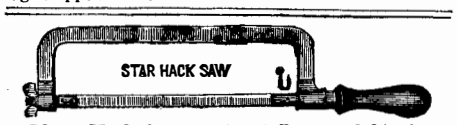

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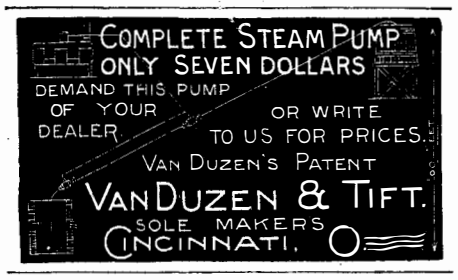

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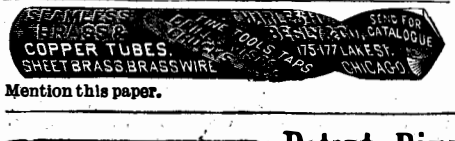

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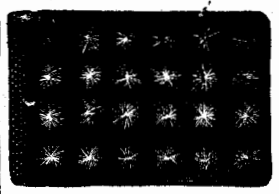

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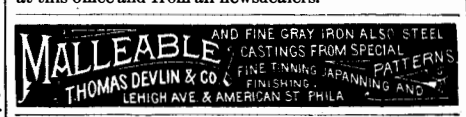
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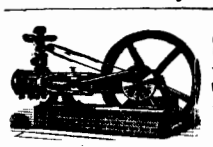

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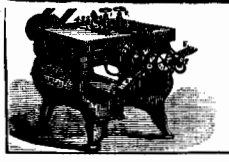

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